

1911 • FIFTY YEARS OF SERVICE TO COAL MINING • 1961

COAL AGE

MARCH, 1961

Productivity p 68

Company Research . p 72

Refuse Disposal . . . p 86

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PRICE \$1



Casting Overburden
With Explosives . . . p 78

10 Specific Reasons Why You Should Switch to **HUL****MUL TODAY**

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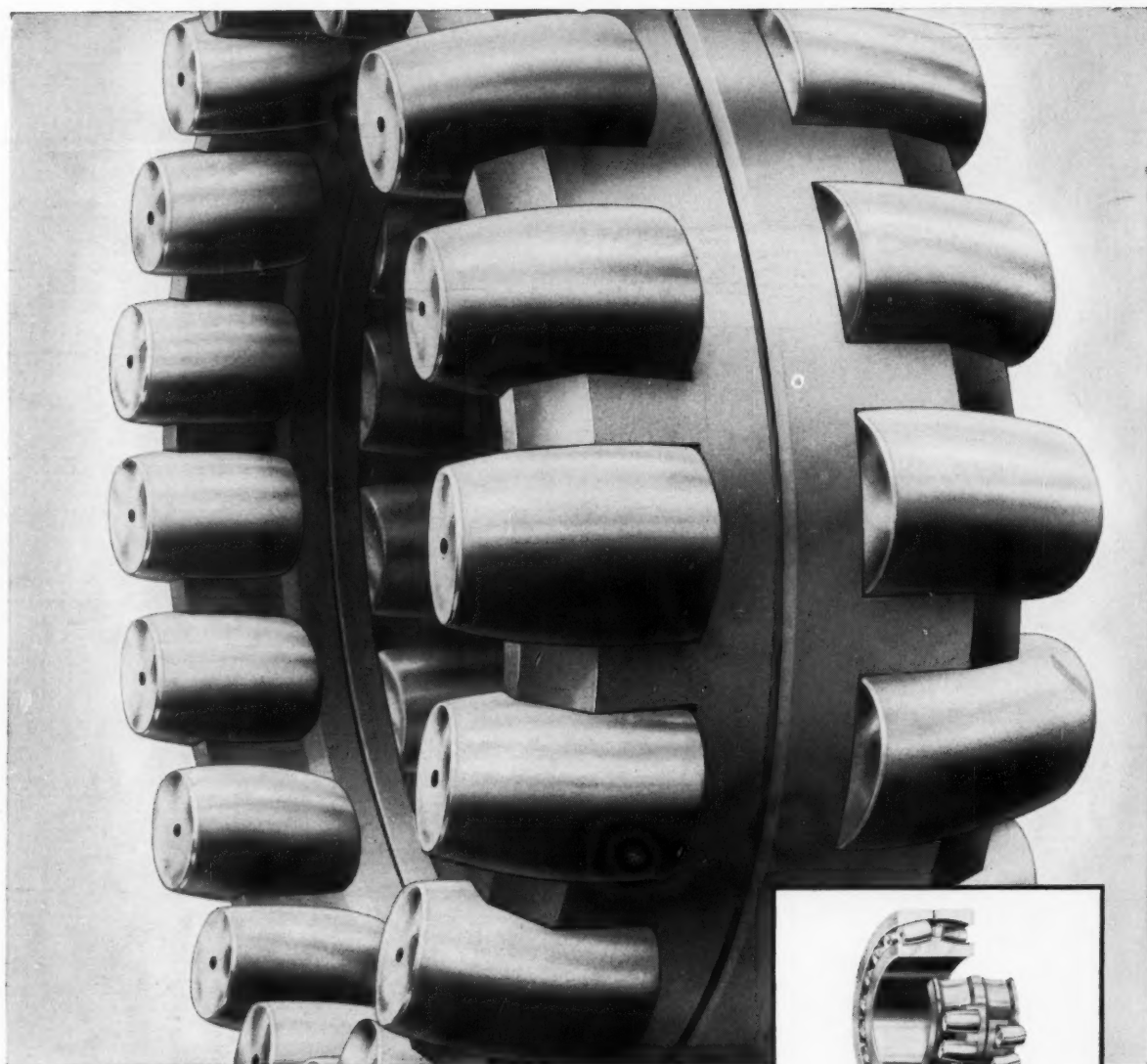
This means BFG fire-resisting belts can be expected to equal, or surpass, the long service records made by other B.F. Goodrich Caricoal belts in underground mines.

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as fire-resistant by the Bureau of Mines (Acceptance No. 28-6). Your B.F. Goodrich distributor can tell you more, or write the *B.F. Goodrich Industrial Products Company, Department M-989, Akron 18, Ohio.*

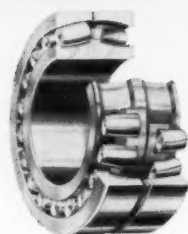
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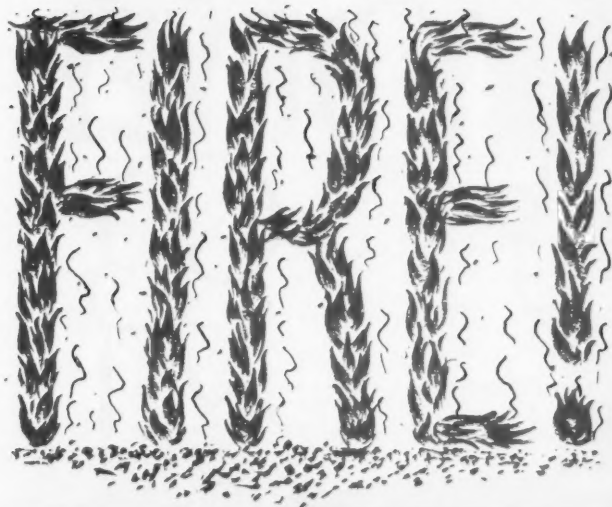
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- Reach trapped men safely through foam without equipment.
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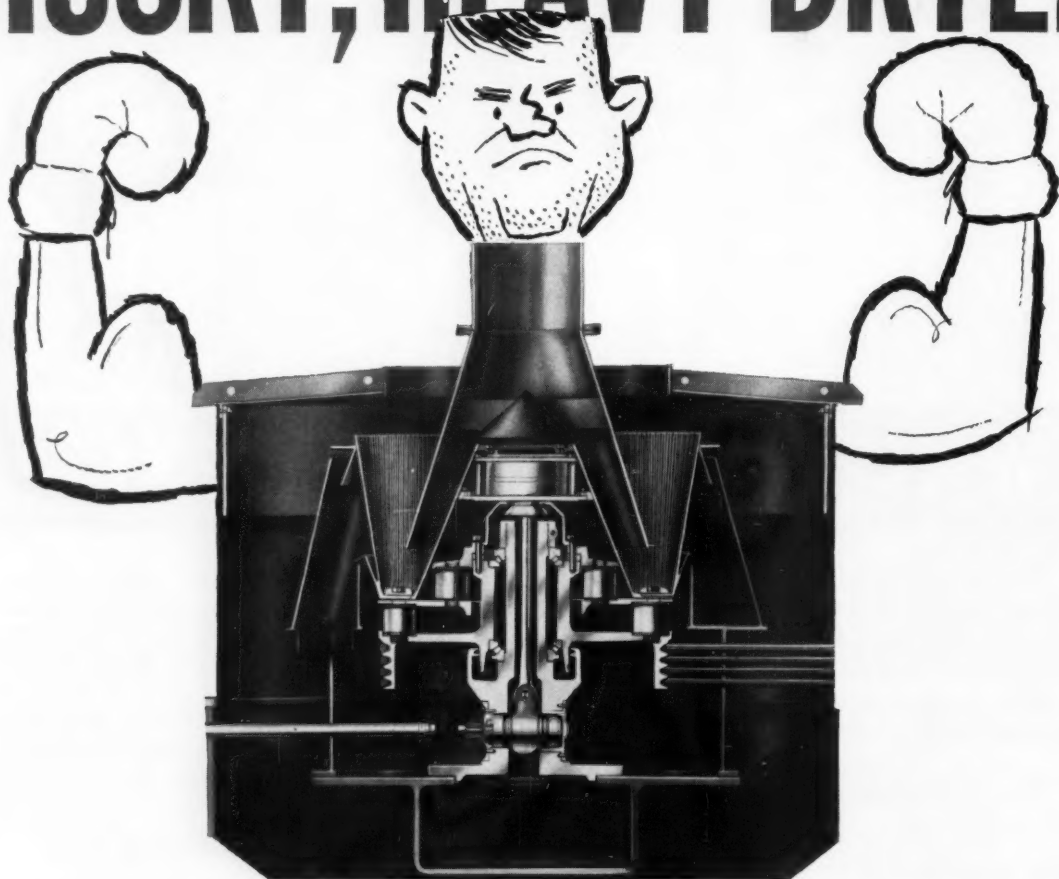


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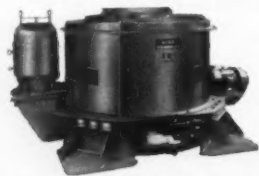
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This Month in

**COAL
AGE**

March, 1961

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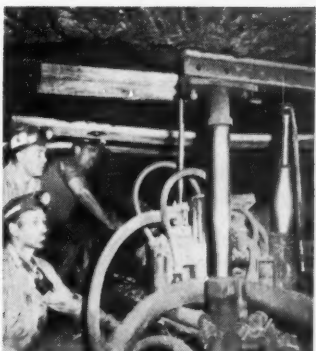
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**Economics** Edward G. Fox, Bituminous Coal Operators**Productivity . . . Progress and Problems p 68**

Productivity is a measure of the efficiency with which goods and services are produced, that is, the ratio of the output of goods and services to the input of resources. It accounts not only for manpower resources, but also capital investment and the resourcefulness of management in providing new and improved methods of production. Industrial progress has often required individual adjustments that are not easy to make, which is one of the regrettable aspects of present unemployment in coal regions. Conversely, any attempts to institute "full crew" laws in coal would quickly bankrupt the industry by making it impossible for coal to compete with laborless fuels.

**Operating Research****In-Company Research Ups Safety, Efficiency p 72**

"Operation Research" at the Ireland mine of the Hanna Coal Co., is aimed at generating worthwhile advances by the mine staff and also taking prompt advantage of new equipment and products offered by manufacturers. The payoff is in the form of improved safety and efficiency. Developments contributing to these results include the hollow-steel dust-collector system for roofbolting, foam-plug fire-fighting equipment, improved water-spray system for continuous miners, inexpensive foolproof rail-haulage signal device, automatic trolley cutout switch, and improved mine-car holders and wheel chocks. Diagrams, photographs and detailed descriptions of these developments are included.

**Stripping****Casting Overburden With Explosives p 78**

In casting with explosives large amounts of low-cost blasting agent are loaded into medium-diameter blastholes, usually in a ratio of more than 1 lb of agent per cu yd of rock. The resulting blast moves a large portion of the overburden into the spoil area. In dragline stripping, the dragline is then able to work atop the spoil pile. Advantages are (1) easier digging for the stripper, (2) less reclamation leveling and (3) more coal uncovered in less time. Stripping capacity can be increased without capital investment.

Special—Comparative cost analyses.

(Continued on p 7)

Metallurgical Memo from General Electric



Bit illustrated: CCS-3

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We purposely build uniform quality into every Carboloy mining bit . . . we make the tips extra long . . . we provide a stronger braze. Why? To keep your machines producing longer, more dependably, **AND AT LOWER COST!**

Your local Authorized Carboloy Mining Tool Distributor and our local engineer are equipped to give you all the facts and assistance you need. Or write: *Metallurgical Products Department of General Electric Company, 11120 E. 8 Mile Road, Detroit 32, Michigan.*

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Services

Automatic Refuse Disposal p 86

An automatic aerial tramway that carries 70 tph of refuse across the mountain to the next valley solves a tough refuse-disposal problem at Rochester & Pittsburgh's O'Donnell No. 2 mine, near Gilmer, W. Va. Once the tramway is put in operation by push-button the automatic controls take over and keep the unit shuttling back and forth between the plant and disposal area. It carries a 5-ton payload of refuse across the mountain every 4½ min. By choosing the aerial tramway, R & P eliminated the cost of building a road, as well as high costs for road and truck maintenance costs.

Maintenance Ideas

Maintenance Arc Welding p 88

Arc welding is as much a part of maintenance as haulage is to the mining cycle. Its functions and equipment should receive the same care and attention as any other phase of the maintenance program. The selection of welding equipment, classification of welding jobs, selection of proper electrodes and welding procedure are covered in this article to help you evaluate your present maintenance-welding program. A glossary of electric welding terms, welding symbols and diagrams of common weld joints are included.

Preparation

Greater Efficiency, Higher Quality Products p 94

Preparation-plant improvements at Glogora Coal Co., have widened profit margins by an increase of 12% in plant efficiency and broadened market potential by producing higher quality products. A 700-tph Daniels dense-medium washer and associated equipment were installed to effect the improvements initially established by the company. Plant operating time was reduced to one shift. Gains also were realized in the cleaning cycle by recovering more coal from the mined product. Ash content of cleaned coal was reduced to the point where it could be marketed attractively. Magnetite consumption has averaged less than ½ lb per ton for the first 6 mo. (Continued on p 9)

This Month in **COAL**

STILL NO LIFT—The modest bituminous production rate of January and February shows no signs of lifting appreciably as yet, though the March rate will more closely approximate that of March, 1960, as a result of the drop in that month from the higher levels of the first 2 mo of that year.

Prospects for the second quarter? No signs yet of any significant lift in output, in turn reflecting the continued dullness of business in general.

Anthracite—The bitter weather of January and February gave anthracite a lift it has not experienced in many years. March, however, will mark a return to the downward trend of long standing as a result of further competitive inroads.

COAL INVESTMENT—Though overall bituminous output is not expected at the moment to be appreciably higher in 1961 (though later developments could change this picture), there is a growing feeling that the pace of investment in production, preparation and mining facilities will increase in 1961. One reason is the growing backlog of deferred projects and the need to be ready for the future bulge in demand. A second is that coal has learned to live and profit in this present era of low demand, lowering the psychological bar to releasing investment cash. So capital investment this year may be up appreciably.

ON THE OIL FRONT—Though gas still is bitterly op-

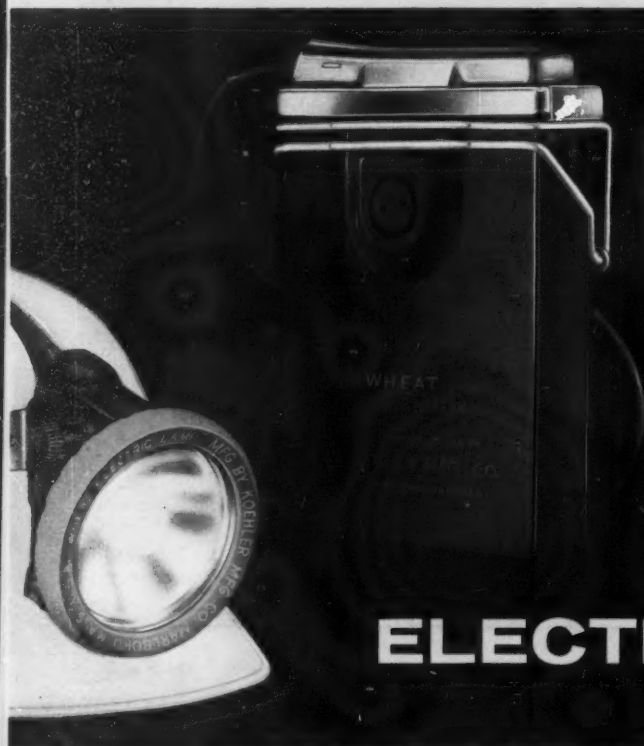
posed, along with many oil-refining interests and the importers, the chances of a national fuels study were measurably improved early in 1961 when the idea was approved by the American Petroleum Institute. The national prominence given to the problems of competition with coal in the Kennedy distressed-area program also has generated additional Congressional interest. As noted, the chances of a study being authorized are much improved at the moment, especially in view of the endorsement of the idea by the Secretary of the Interior Feb. 7 in a meeting with the National Petroleum Advisory Committee.

Future Raw Material?—Another evidence that coal may have a big new market as a raw material for liquid fuels is found in a statement to a representative of Chemical Week, a McGraw-Hill publication, by Monroe E. Spaght, new Shell Oil president, that Shell "will not be tied to one raw material" in developing new products and producing old ones, and that coal "definitely" is in the running.

MORE RATHER THAN LESS—The tax climate in the future is one of the questions involved in living on "The New Frontier." If announced plans are carried out even in part there will be no reduction in the burden and the pressure will be to increase it. In addition, states and local authorities are going down the same road, and one reflection is increased consideration of the possibilities of new severance taxes on minerals and increases in the old.

IN LESS THAN TWO YEARS SINCE ITS INTRODUCTION

—the most impressive acceptance
ever accorded a new lamp model
by the mining industry!



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National

MODEL

ELECTRIC CAP LAMP

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A PERFECT SPOT EVERY TIME

Never before has it been so easy for the miner to get the spot he wants. A turn of the switch knob and there it is —and right, every time! A perfect brilliant spot is equally obtainable with either of the two full-power identical filaments.

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SIMPLEST MAINTENANCE FOR LOWEST COST

Ordinary cleanliness, weekly watering and occasional bulb replacement are the simple maintenance requirements of the Wheat National. There are no covers to open, no terminals to clean, no valves to free, no cells to re-solution, no lamps to rack. Wheats need a minimum of manual attention.

Write for WHEAT Electric Cap Lamp Bulletin No. 593—free on request.

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IN CANADA:

NATIONAL MINE SERVICE (CANADA) LIMITED, Elliot Lake, Ontario

Reflections on Mine Management's Job In the Challenging Years Ahead p 99

A 4-p special presentation on the problems and opportunities which lie ahead . . . and how the editors feel *Coal Age* can be of help to management in the years ahead.

Accounting

Dause L. Bibby, President
Remington Rand

Modern Office Methodsp 103

Many mine operators have allowed an unfortunate paradox to develop within their organizations. They have been quick to take advantage of modern techniques in engineering and operations, but slow to adopt modern office practices. The result is excessively-high overhead costs. In addition, the broad benefits of modern administrative control are missed. There are available now computers for smaller companies.

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THIS MONTH . . . In Mining Practice

HIGHWAY CHALLENGE?—The number of installations to date is possibly ground for saying that the conveyor has not yet challenged the highway in strip-coal haulage. But the challenge may not be far off, in part a result of the development and rapid growth of the lower-cost ropeframe conveyor. This low cost and the simplicity and flexibility of the rope equipment is making it much more attractive to some coal strippers. There may well be additions to the ranks of overland belt users among strip operators on an increasing scale, starting in the relatively near future.

VOLTAGE PRESSURE—The higher horsepower being built into new underground equipment units continues to keep the pressure on for higher voltages in deep mining—1,000 or better. Accentuation of the need for relief also arises out of the characteristics of the AC motor. Heat buildup under excess load and reduced voltage is much greater, and with it, even with new and more-efficient protection, the burnout risk is increased. There is a growing body of opinion that the industry should move boldly forward to a thousand volts or better, since it probably will have to go there eventually.

WIDER AND LONGER—It now is apparent that the shuttle car will be with us in substantial numbers for some time to come. On the basis of present thinking it will be a modified or perhaps radically different unit, especially in view of the present concentration on miners and other machines for the thinner veins. It certainly will be wider, and in many instances it will be longer as a result of articulation. Trains of two or more with universal joints to permit not only movement up and down of units but also turning corners already are envisioned, along with major increases in speed.

STILL IN THE RUNNING—The fact that an industry meeting this month will be devoted to high-speed loading units v. continuous miners is further evidence that the conventional production unit is not giving up without a struggle. At the same time, of course, the miner is not losing its steam. But under some conditions with the high-capacity equipment now available, operators are finding the conventional setup the best.

RIGHT AND WRONG IN SPLICING—Reports and field observations indicate that men concerned with belt conveyors may be getting a little careless with mechanical splices—for example, trying to use one type for all possible applications, or using fasteners too large in size, etc. Manufacturers point out that there is a right type and a right size for the various belts and services, and that both belt life and efficiency are served by remembering this fact.

ANOTHER SIZE BREAKTHROUGH—The scaling-up process in mining equipment continues to pick up momentum in mining. In stripping, the size of draglines is jumping from its previous high of around 35 cu yd to 85. Underground, one of the new continuous miners is rated at 550 hp, with more to come in the future.

Mines Bureau Tells How Addition of Salt Improves Safety of Certain Mining Explosives

News release from the U.S. Department of the Interior, Bureau of Mines: Research by the Bureau of Mines has confirmed that the addition of from 10 to 20 percent ordinary salt to "permissible" explosives used in coal mines increases their safety factor, the Department of the Interior has announced.

A report recently published by the Bureau describes its studies which revealed effects of varying proportions of fine and coarse salt in cooling the flames emitted by explosives, thus lessening their chances of igniting gas or coal dust.

As a result of the research, undertaken in cooperation with the Institute of Makers of Explosives, one major United States manufacturer already has changed his formulas. He now adds 10 percent fine salt to his entire line of "permissible" explosives.

Director Marling J. Ankeny of the Bureau of Mines pointed out that the Bureau does not claim credit for the idea of adding salt to explosives; the practice originated in Europe. However, he added, the Bureau proved, in a series of 2,400 test explosions of 87 different formulations, that permissible explosives with salt additives are safer

and that fine salt is more effective than coarse salt.

The label "permissible" is applied to an explosive after it has been approved by the Bureau for use under carefully specified conditions in underground coal mines. Users sometimes violate accepted safety standards for handling explosives. The Bureau, therefore, always seeks to reduce the so-called incendivity of permissible explosives so that if they are misused they are less likely to ignite gas or dust already in the mine atmosphere.

From 80 to 100 million pounds of permissible explosives are manufactured annually in the United States, and the Bureau believes it is quite likely that all makers of permissible explosives eventually will adopt salt formulas, Director Ankeny added.

Report of Investigations 5683, "Reducing the Incendivity of Permissible Explosives by Sodium Chloride," was written by N. E. Hanna, G. H. Damon, and R. W. Van Dolah. A copy can be obtained from the Publications-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa.

WHO?

This "one major manufacturer," who has manufactured his entire line of permissibles with 10% salt for over two years, is Du Pont. For information, call your Du Pont Explosives Distributor or Representative. Or write Du Pont, Explosives Department, 6440 Nemours Building, Wilmington 98, Delaware.



EXPLOSIVES

BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

The Coal Commentator

1961 Coal Show

Last chance for 3 yr might be one way of looking at the 1961 Coal Show of the American Mining Congress, to be held in Cleveland, Ohio, May 15-18. But an even better approach is to look at the new opportunity it provides for progress in mining, preparation and safety.

The coal recession might be cited as a reason for limiting participation. Actually it is one of the most powerful reasons why one should take in the show. Not only can one better learn how to live and make money in a time of low production, one also can begin to plan for the inevitable pickup in demand.

Both now and in the days to come, the prize will go to the ones best prepared to compete for it. A visit to the Coal Show is mighty fine training.

The Layering Problem

Layering of methane along the roof was quite common in the old days when there was little or no ventilation, then became less so with improvements in fans and coursing, and now is back into the picture—not because of lack of air but because of the increased quantities of gas encountered with rapid mining-unit advance.

The British have the problem too, and have been looking into it from the standpoint of how roof layering becomes possible and second what can be done in the line of prevention. They possibly have at least one possible new idea for breaking up layers immediately behind the discharge end of tubing at the face. It is a splitter-deflector which takes a part of the air, turns it back nearly 180 deg and directs it against the roof.

This device is not necessarily a cureall but it is one of the new approaches to a situation which has not been easy to correct. But progress can and is being made, and probably there will be not one but several answers to compensate for varying conditions.

Lignite Broils

Pretty soon, when you want to incinerate a steak, you can do it with lignite—in the form of a new briquette. Husky Oil Co. and Arthur D. Little Co. developed the process, and manufacturing will be done at Dickinson, N. D. If you want to buy some this summer, look for them under the label of the Kingsford Co.

Briquettes will not suddenly revolutionize the lignite industry of the Dakotas and farther west, but it is one more sign that this enormous reserve

of energy may find use in substantial quantities in the not-too-distant future. In fact, if the area where lignite is found had the population of the East, there would be a big lignite mining industry. It may come to pass. Meantime, your commentator likes his beef rare, and will anticipate the extra goodness lignite will give it.

Honor to Reilly

No other is known of by your commentator, which makes James D. Reilly, vice president of the Hanna Coal Co., unique in the coal-mining industry of the U.S. In other words, he is the only coal man so far to be made a Chevalier of the French Legion of Honor, the highest civilian honor bestowed by the French government.

This honor came to Jim Reilly late last year and was bestowed for his contribution to French reconstruction after World War II in the form of a practical program for coupling modern mining techniques with a modern human relations program in the iron industry. The program worked, hence the honor, which was fully merited as all who know him and what he had done in his rise to a position of major responsibility and influence in the industry, can testify. And this event is further reflection of the fact that skill in relations with employees and just plain people still is and will remain a vital commodity if the most is to be attained from modern equipment both today and tomorrow.

Repeat in Russia

Coal production in Russia hit 513 million tons in 1960, or 1% more than in 1959. It is perhaps too early to say that the rate of expansion is slowing down, but the pattern of energy development in the U.S., it appears, is being repeated in Russia. In other words, oil and gas have come in and are now becoming major factors. These two fuels, McGraw-Hill's Moscow News Bureau reports, accounted for 38.2% of the fuel market in 1959—not as much as in the U.S. but a rapid growth to a big chunk, nevertheless. The rate of growth will accelerate, as it did in the U.S.

Europe, too, is still scheduled for the same type of development, but the process is slower because gas, in particular, must be brought in from the outside—Africa specifically. But grow will gas, and also oil. And the process will be painful for coal, coal owners and coal miners in Europe, as it was in the U.S. Russia, however, will escape these pains because in her case all she will need to do is stop building new mines.

NEW R/M COALMOVER BELT

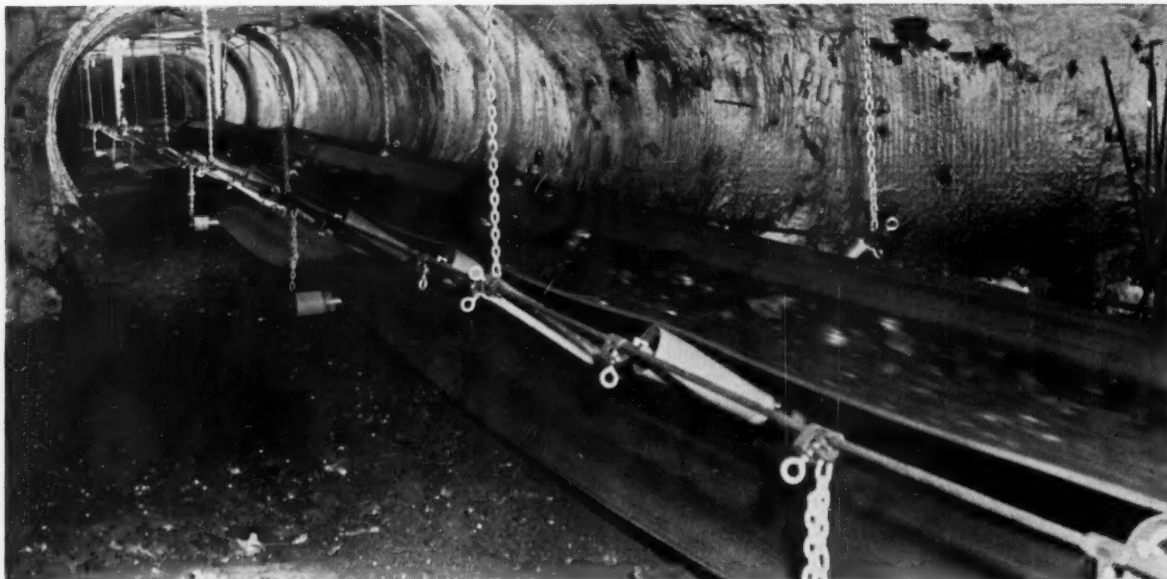


Photo courtesy Goodman Mfg. Co.

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Check these belt advantages for *your* underground conveyors. Each is an engineered feature of a completely new belt construction for the coal industry—all are available *only* with new Coalmove Conveyor Belt.

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"COALMOVER" HAULS MORE...LASTS LONGER...COSTS LESS

RM117



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In extreme sulphur conditions . . .

KENNAMETAL* U3RA Bits boosted production and reduced bit cost

Irregular occurrence of sulphur lenses and balls causes a wide variety of mining conditions in the Pittsburgh No. 8 Seam. At one northern West Virginia mine, for example, bit cost for one section was only 1 cent a ton. Yet the mine average was 5½ cents. When they hit severe sulphur nests, the average jumped to 9 cents, with individual sections running as high as 67 cents. Production in those sections had to be stopped until a more economical method could be found.

On 1JCM miners, the company had been using standard carbide bits with a ½" x 1" shank. As would be expected, tip failures occurred more often than in normal cutting, but shank breakage was the big problem.

First, they tried lower cost steel bits with hardfaced tips. This lowered bit cost considerably, but it also lowered production . . . too much to become an accepted answer to the problem.

Next, they tried Kennametal U3RA Cutter Bits. This bit's stronger shank not only reduced shank breakage,

*Trademark

but also reduced the frequency of tip failures. Bit costs immediately dropped from 9 to 7 cents a ton. Much time formerly lost for bit changes was converted to operating time . . . and production more than doubled.

Ask your Kennametal Representative or Distributor how Kennametal bits can improve *your* production. Let him help you select and actually test in your mine the Kennametal Bit best suited to your operating conditions. KENNAMETAL INC., Mining Tool Division, Bedford, Pa.

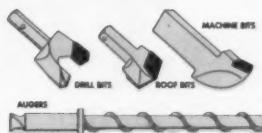
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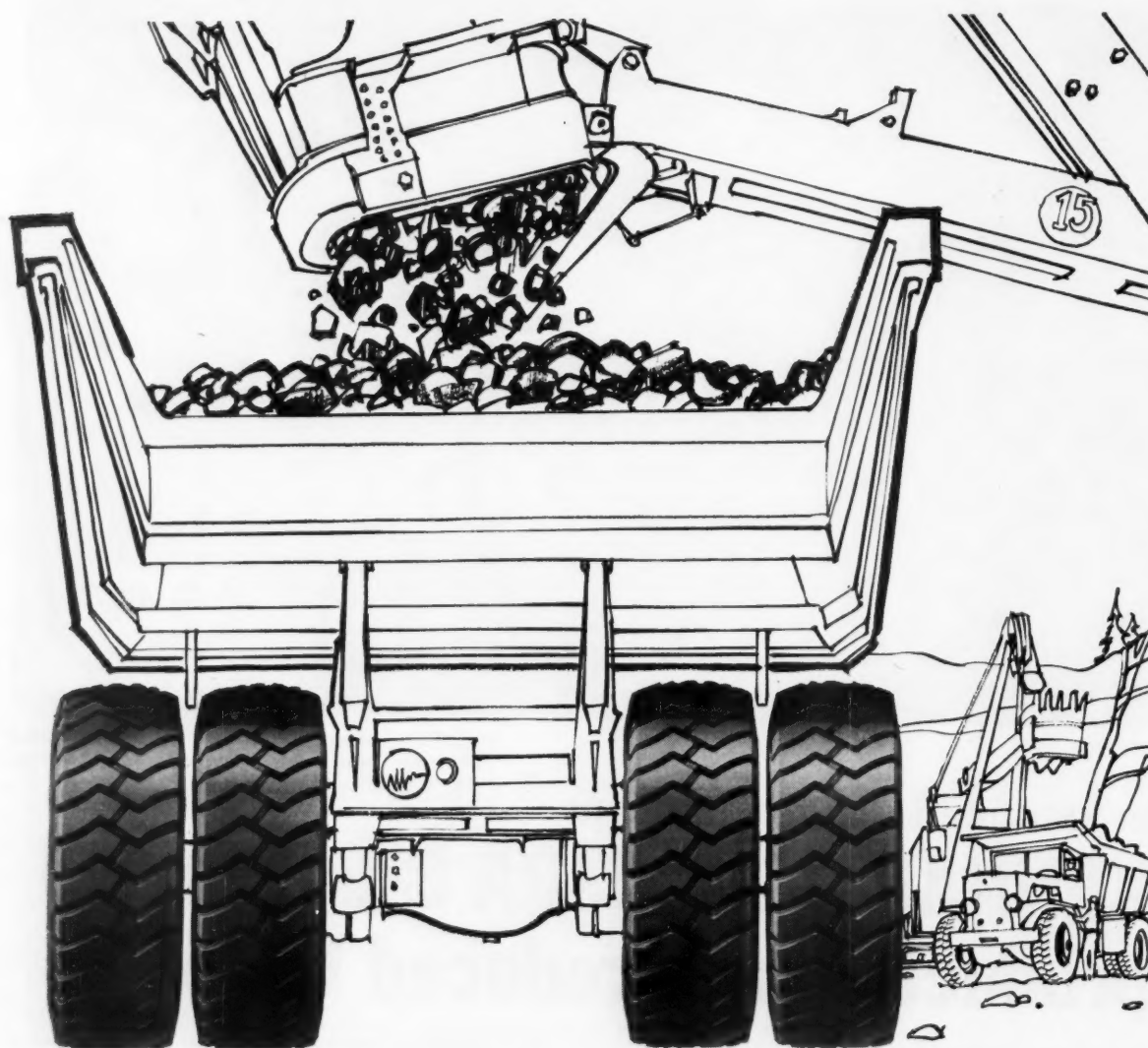
COMPARATIVE BIT PERFORMANCE

Different bits—same section—severe sulphur

	Bits changed per shift	Tonnage per shift	Bit cost per ton
Standard carbide bit	200	225-240 tons	67¢
Hardfaced steel bit	300	175-218 tons	33¢
Kennametal U3RA bit	150	435-652 tons	27¢

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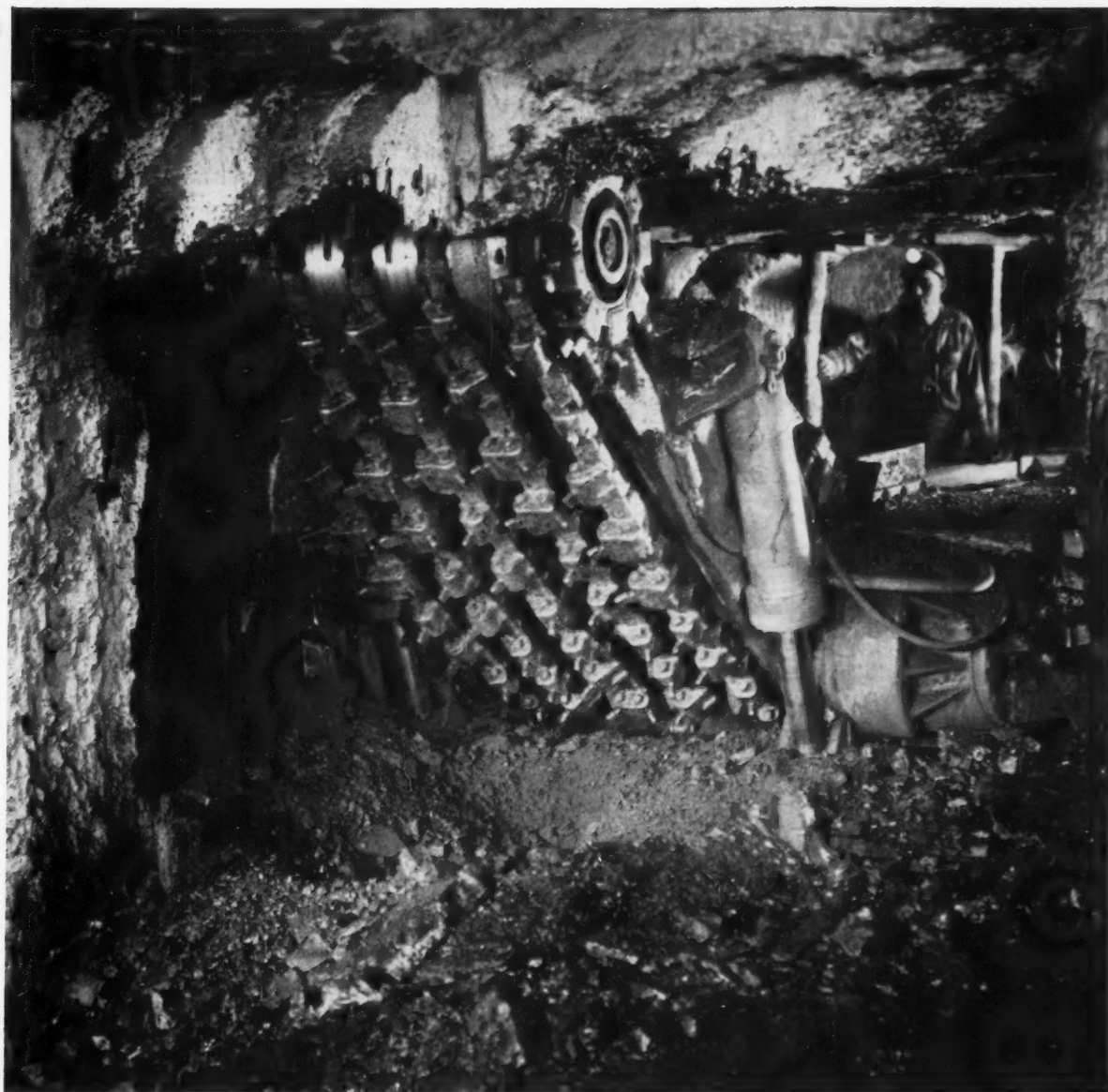
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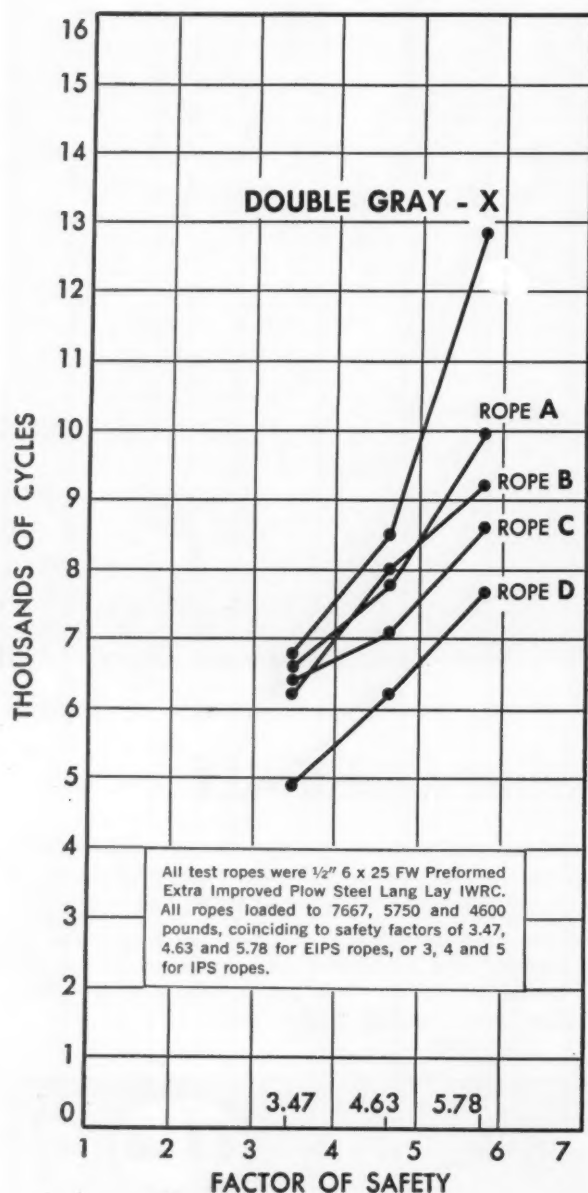
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DOUBLE GRAY-X[®]

Laboratory tests prove that CF&I-Wickwire's premium wire rope has 45%* more bending life than the average of other ropes tested



The CF&I-Wickwire engineers who developed Double Gray-X *believed* in their product. So confident were they of its superiority that they decided to field-test prototypes of Double Gray-X as soon as they were perfected. In the months that followed, the top American firms chosen to participate in these tests delivered this verdict: when the going really gets tough, Double Gray-X lasts longer than other wire ropes.

Now, CF&I presents additional proof that Double Gray-X has *superior resistance to bending fatigue*, the chief enemy of wire rope life. In an extended series of tests conducted over the past year at CF&I's Palmer Plant, Double Gray-X proved itself superior to four other wire ropes, all made by major manufacturers.

HOW WERE THE TESTS CONDUCTED?

The five wire ropes tested—all identical in size and specification—all exceeded the catalog breaking strength of extra-improved plow steel ropes. Each rope was subjected to the same series of tests on a 25,000-pound, multiple-reeved fatigue machine, the largest of its kind. This machine punishes wire rope to destruction by bending it back and forth over sheaves.

*Percentage above average of all other wire ropes tested at safety factor of 5.78

lasts longer

WHAT WERE THE RESULTS OF THE TESTS?

As the chart indicates, Double Gray-X lasted longer than any of the four competing wire ropes at all the safety factors used in the test. At the highest and most commonly-used safety factor, Double Gray-X lasted 30% longer than the rope that lasted next longest, and 68% longer than the rope that lasted the shortest time. Double Gray-X lasted 45% longer than the average of all other wire ropes tested at this safety factor.

WHY DOES DOUBLE GRAY-X LAST LONGER?

It lasts longer because it's the result of a breakthrough in wire-drawing technique. This new process, which includes the use of molybdenum disulphide, creates these outstanding fatigue-resistance factors in Double Gray-X:

- **A Molecular Shield** — Molybdenum disulphide creates a shield around every wire, which serves as a lubricant and prevents the wires from grinding together as the rope operates. Less internal friction results in longer rope life.
- **Smoother Wire Surface** — CF&I's new wire-drawing technique helps eliminate minute surface imperfections in the wire. This smoother surface provides better resistance to fatigue.
- **Extra Toughness** — Molybdenum disulphide lubricates the wires during the drawing process. Since less power is required and less heat generated during this operation, the original toughness of the wires is better preserved.

WHAT CAN DOUBLE GRAY-X DO FOR YOU?

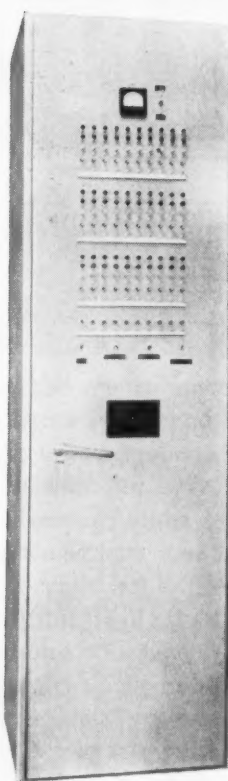
It can save you money. Because Double Gray-X lasts longer on even the toughest jobs, it cuts wire rope repair and replacement costs and rope-installation time. The net result to you is an overall reduction of costly equipment downtime, and a lowering of your total wire rope investment.

As a matter of fact, those of our customers who have already bought and field-tested Double Gray-X have reported considerably longer life and less downtime on their equipment. Join these satisfied customers—try Double Gray-X on *your* equipment right away. Ask your CF&I salesman to give you complete details on these tests.



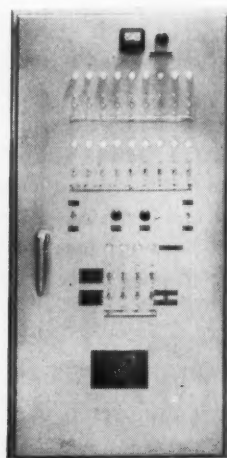
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30 CIRCUIT BREAKERS

small mines



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14 CIRCUIT BREAKERS

There's a FEMCO 709 system to meet your needs

Fan-actuated power shut-off plus centralized monitoring and remote control over a single pair of wires

No matter how many fans and circuit breakers . . . no matter what distances are involved . . . no matter where the power comes from, there is a 709 system which will provide these services:

1. Automatic shut-off of power going into the mine in the event of fan failure.
2. Centralized monitoring of all fans and circuit breakers.
3. Selective remote control of all circuit breakers and, if desired, of all fans.

The heart of this system is the Femco Circuit Scanner. Essentially, this is a synchronous commutator using hermetically sealed reed switches instead of sliding contacts.

A rugged clock motor drives a rotating arm on which is mounted a permanent magnet. As the arm passes each switch, the magnet closes that switch. The circuit thus established is maintained long enough to permit transmission of an indication from the field station and, if desired, a control impulse from the central station.

Scanners are located at each field station and at the central control station. Special circuits keep all scanners in synchronism. Since the scanner motors operate continuously, no extra starting circuits are necessary, thus simplifying the system and keeping costs down.

We will be glad to send you further information, or to discuss the Femco 709 system as it applies to your specific situation. Just write or call FEMCO, INC., IRWIN, PA.

A-202

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COMMUNICATIONS: Carrier and wired audio systems for all mining and industrial applications. **MONITORING:** Fans, circuit breakers, valves, pumps, compressors, etc. **TELEMETERING:** Flows, pressures and other functions. **REMOTE CONTROL:** Pumps, valves, circuit breakers, soaking pit covers, furnace doors, cranes, or other moving equipment.

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BY CATERPILLAR



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CAT D343
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Turbocharged-Aftercooled D343 provides 420 HP maximum at 2000 RPM, electric set produces up to 250 KW.
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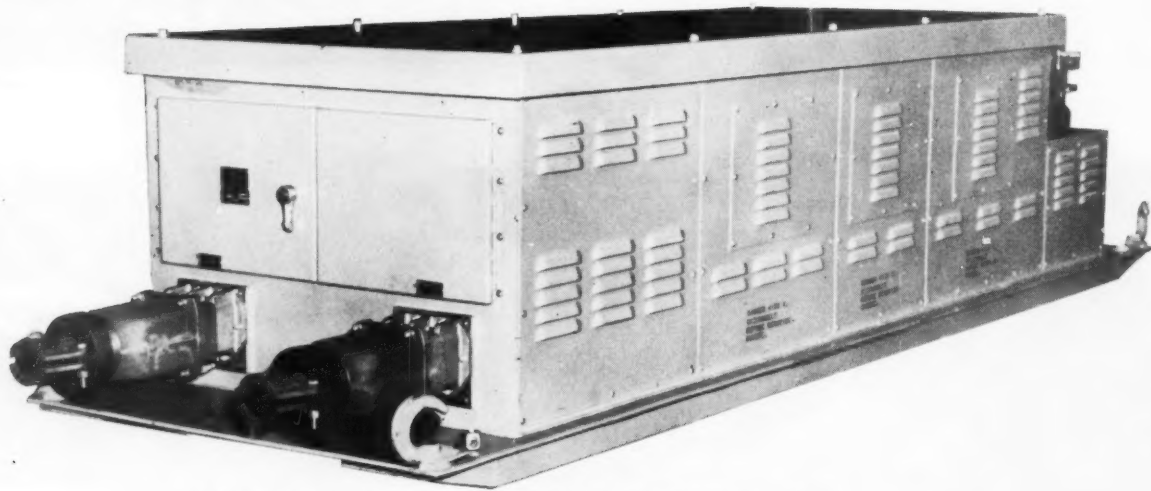
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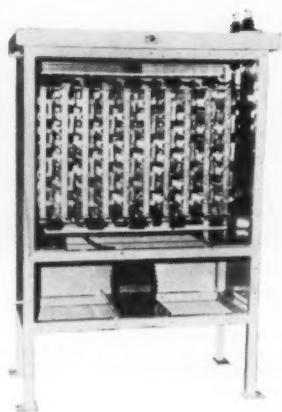
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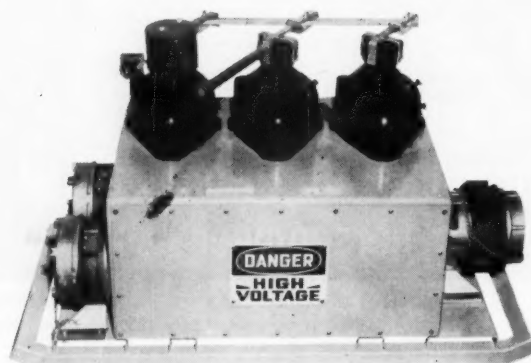
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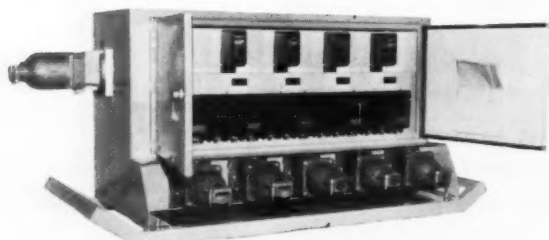
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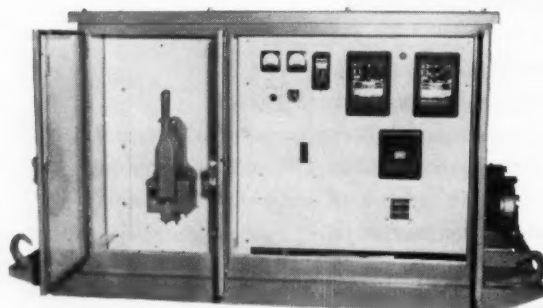
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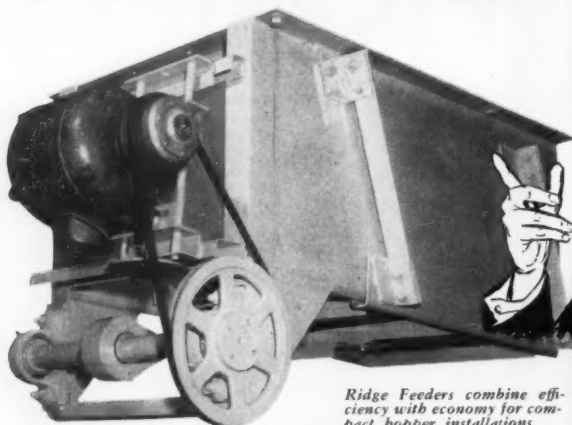
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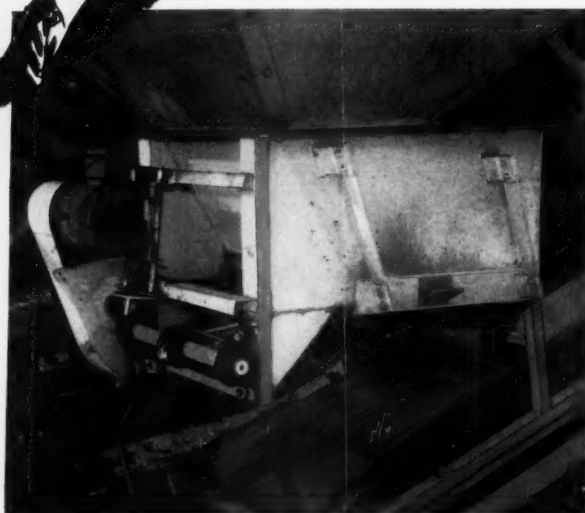
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Ideal for re-railing,
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(shown) for Medium Seams
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Extensive research has also shown that Spencer N-IV, when mixed with the recommended 6% fuel oil, delivers 20% to 25% more blast energy than equal charges of other solid ammonium nitrate-fuel oil mixtures. There are two main reasons for this: (1) lower density which provides greater ease of detonation, (2) special prill structure which allows fuel oil to be absorbed more evenly.

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40% Gelatin Dynamite	257	115	372	1,770
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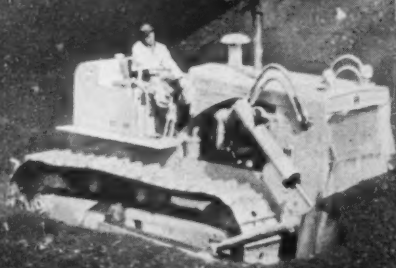


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Planet Power-steered..Hi-Lo outblade clutch-steered

With exclusive "live track" Planet Power-steering, the International TD-25 makes full-load, full-power turns—or slams straight ahead with offset loads—where giant clutch-steered rigs slip and slue. With exclusive Hi-Lo, on-the-go power-shifting, the "25" gives you instant cut-to-fill matching of power to condition. You roll up big loads—and keep 'em rolling. With exclusive International DT-817 engine wallop the "25" bulls along, 230 turbocharged hp strong—without "slow-motion" lug-downs, even at high altitudes! Prove to yourself the planet-drive "25" clobbers all comers—outpushes or outpulls 'em up to 50% —and with standard equipment. Let your International Construction Equipment Distributor demonstrate.

◀ **Dozing volcanic cinders for railroad ballast,** this International TD-25 beats the combined production of two similar-sized clutch steered crawlers on the same job! Reason: Hi-Lo power-shifting gives exclusive 4-speed torque-converter efficiency-range control. The "25" delivers heaped loads every pass! To defy "grinding compound" conditions, the "25" undercarriage has heavy-duty Dura-Rollers.





Even with an enormous offset load of shot rock there's no "bank-nosing," no sluing. The TD-25 operator simply runs the load-side track in high-speed range—the other in low-speed range. Result: full-capacity, straight-ahead performance—which the "25" also gives on benching, bank-cutting, and side-casting! In the same way, you make full-load turns—because Planet Power steering eliminates "dead-track drag!"

With Hi-Lo on-the-go power-shifting you shift down, to dig hard material—shift up, to "run" with the load. And to make full-load turns without spillage, use Planet Power steering: down-shift the turn-side track, and you've got it made! When push-loading with the "25", you maintain solid contact on straight-away or curve—to speed heaping the bowls and get gear-higher "kick-outs"!

power-shifted "25's" crawlers up to 50%!

With the same 2-finger ease as on dozing or push-loading, you steer the TD-25 pulling heaviest drawbar tools. This "25" is deep-ripping "concrete-like" mountain clay that has to be shattered before dozer can move it economically. The "25" has the super undercarriage strength of double-box-beam track frames—for full-capacity performance.



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A COMPLETE POWER PACKAGE

News Roundup

Supreme Court Supports FPC on Gas Ban

Marking the culmination of a long fight by the coal industry to achieve some balance of equities in competitive fuel markets, the Supreme Court decision on Jan. 23 in the Consolidated Edison case upheld the Federal Power Commission's authority to give effect to principles of conservation in administering the Natural Gas Act.

On the matter of the commission's authority to consider end use, the court stood 9-0. On this point the court noted: "One apparent method of preventing waste of gas is to limit the uses to which it may be put, uses for which another, more abundant fuel may serve equally well." As for the price, the court held, "As a matter of common sense, it would seem difficult to deny that the channeling of vast quantities of a wasting resource into unregulated transactions at a high price will result in scarcity to other consumers and a general price increase."

In the case noted, FPC had denied Transcontinental Gas Pipe Line Corp. authority to transport natural gas for Consolidated Edison Co. from southern Texas to Con Ed's Waterside electric generating plant in New York City. FPC refused a certificate for the pipeline on grounds that this would be an "inferior use" of a valuable natural resource, that the practice could preempt pipeline capacity and gas reserves to the detriment of domestic consumers competing for gas supply and that such sales would lead to a general rise in field prices for natural gas.

The decision ended speculation and confirmed that the conservation authority of the FPC is inherent in the Natural Gas Act and its legislative history.

It now seems reasonable to expect that the commission will examine carefully any pipeline proposals involving boiler fuel use of gas, particularly where coal is readily available at reasonable cost.

Peabody Plans Ahead

Significant plans for property developments over the next 3 yr have been formulated by Peabody Coal Co., St. Louis, Mo. Involving a minimum expenditure

of \$50 million over this period, these plans include construction of the new mine near Paradise, Ky. which will serve the 65-million-ton TVA contract, an 85-yd dragline and a duplicate of the 115-yd shovel now being built for the Paradise Mine.

Principal projects involved in the program are scheduled for completion in the latter part of 1962 and 1963. The company has spent approximately \$123 million for property additions and improvements since 1955, according to Merl C. Kelce, president of Peabody.

Also announced were comparative results from operations for the years 1960 and 1959. Total coal tonnage sold in 1960 was 30,001,044 as against 26,907,378 in 1959. Net income for 1960 amounted to \$12,469,293; for 1959, \$11,339,772. Based on outstanding shares at the end of each year, net income per share for 1960 was \$1.26 and for 1959, \$1.15.

Japan Contracts for U.S. Coal

Mount Rainier Coal Co., a subsidiary of Pacific Co., has signed a 4-yr contract with Mitsubishi Shoji Kaisha Ltd., Tokyo, representing eight Japanese steel producers, for shipment of 800,000 tons of coal to Japan.

This represents the first use on long-term contract of western United States coking coal for Japanese steelmakers. Japan has been using coal from Canada, Australia and the Soviet Union.

Shipments to Japan will begin early in 1962, following installation of new washing equipment and other facilities at the mine, which is in Wilkeson, Wash. The Port of Tacoma, Wash., will erect loading facilities for the coal shipments, which

will be brought to dockside by the Northern Pacific Railway.

The contract comes as a culmination of research conducted for the past 4 yr by Mount Rainier. This centered on reducing the high ash content of the Wilkeson coal, using techniques developed during the past 5 yr in Germany.

C&O, B&O Close to Merging

At least 64% of the shares of the Baltimore & Ohio RR have been committed to the stock exchange offer of the Chesapeake & Ohio Ry, according to preliminary tabulations. The exchange of C&O shares for B&O shares affiliates the two railroads as a first step toward merger.

C&O's shareowners will meet March 24 at the Greenbrier, White Sulphur Springs, W. Va., to vote on one feature of the stock exchange. The plan itself was approved by C&O shareowners at a special meeting held Sept. 14 when 99% of the shares represented approved the proposal. Feature now to be approved will be the accrual of C&O "dividends" for B&O shareowners who have assented their shares.

Managements of both railroads, including personnel from all departments, are already in process of making plans for coordinated activities.

TVA Seeks Coal Bids

Bidding was opened Feb. 14 by the Tennessee Valley Authority on long-term contracts to supply coal to seven steam electric-generating plants in Tennessee, Alabama and Kentucky. Spokesmen said the agency is interested in buying 50,000 to 70,000 tons of coal a week under a long-term contract.

Plants involved are Shawnee, in southeast Kentucky; Johnsonville, Gallatin, John Sevier and Kingston in eastern Tennessee; and Colbert and Widows Creek in northern Alabama.

Delivery dates are to begin in March, April or May with later beginning dates being considered. Restrictions on weekly offers and terms are noted in the invitation to bid, which states TVA's preference in contract duration and reserves the right to limit to 10 yr any bid that offers a longer term.

In This Section

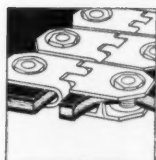
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You feel safer with FLEXCO® HINGED SPLICES

WHILE WE DO NOT RECOMMEND THIS WAY OF TRAVELING UNDERGROUND, IT DOES SERVE TO DRAMATIZE THE FEELING OF CONFIDENCE MINERS HAVE WHEN THE BELTS THEY WORK WITH ARE SPLICED WITH FLEXCO HINGED FASTENERS!



9 GOOD REASONS WHY FLEXCO HINGED FASTENERS MAKE THE BEST BELT SPLICES!



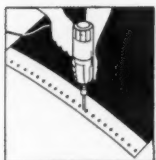
1. TREMENDOUS HOLDING POWER—provide maximum holding strength and pull-out resistance in both new and old belting.



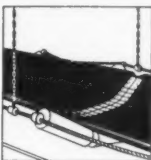
5. NO BELT DISTORTION—curved template corrects for swelling of belt when fasteners are applied. Result: load distributed evenly across entire splice.



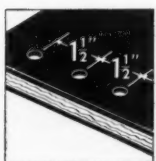
9. COMPLETE JOINT IN ONE CARTON—packed ready to install. Available for any width belt.



2. POSITIVE APPLICATION—no guess-work! Template provides for correct number and proper spacing of fasteners for any width belt.



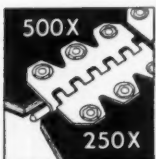
6. TROUGHABILITY—splices readily conform to curve of any type troughing idlers on rope suspension or rigid frame conveyors.



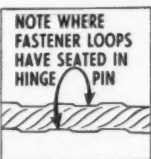
3. FEWER HOLES IN BELT—carcass deterioration held at a minimum (unlike perforating type fasteners which weaken belt with many damaging holes).



7. DAMAGE TO JOINT—any fastener can easily be replaced. Just remove nut and bolt, and substitute new plate.



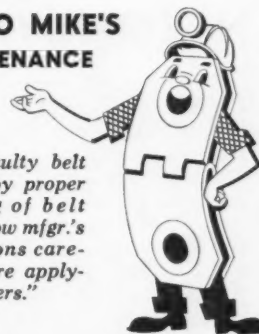
4. ONE TYPE FASTENER TO JOIN DIFFERENT BELT THICKNESSES—250X, for thin belts, will mesh with 500X, for thick belts.



8. NON-MIGRATING HINGE PIN—pioneered by Flexible. Self-lubricating, steel-tipped nylon covered pin will not work out of splice!

FLEXCO MIKE'S "MAINTENANCE TIP"

"Avoid faulty belt tracking by proper squaring of belt ends. Follow mfg.'s instructions carefully before applying fasteners."



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News Roundup (Continued)



FIRST TO COMPLETE 100% FIRST-AID TRAINING in Illinois in over 20 yr, was the Murdock mine of Bell & Zoller Coal Co. A certificate noting the accomplishment was presented by the U. S. Bureau of Mines. Shown at the presentation ceremonies are Coy L. South (left), safety director; John Cebulsky, president, local union; W. W. Kessler, inspector, USBM; and Elmos Williams, superintendent.

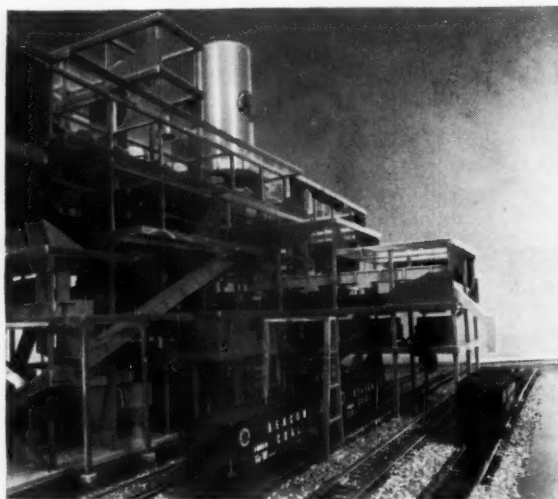
NEW MULTI-MILLION-DOLLAR COAL CLEANING AND PREPARATION PLANT, being built by Eastern Gas & Fuel Associates, will have a capacity of 12,500 tpd. Cutaway scale model of the tippie construction is shown. The plant, which will use the heavy media washer, Deister table and froth flotation methods of preparation, will serve Eastern's Federal No. 1 coal mine at Grant Town, near Fairmont, W. Va. Full operations are contemplated for early 1962.

Normal operations have been continuing at the mine throughout the construction through the use of the present coal handling facilities which ultimately will be removed. One of the principal uses of coal from the Federal mine is for electrical power generation.

The new plant represents the final stage in an improvement and expansion program which has included a new shaft, skip hoist, and auxiliary facilities, including 8,000 ft of underground mine track and 600 large mine cars.



NEED FOR A NATIONAL FUELS POLICY is one of the subjects under study by Stephen F. Dunn (left), president, NCA; Rep. George Huddleston Jr. (D-Ala.); and Michael F. Widman Jr., director, Marketing & Research, UMWA. Six other countries are giving thought to national fuels policies as a result of the International Labor Organization conference held in January in Geneva, Switzerland, on "Social Consequences of the Crisis in the Coal Industry." They are Belgium, France, Germany, Japan, the Netherlands and the United Kingdom. Mr. Dunn was one of three U. S. delegates to the meeting.



New Orders Forecast

New orders this year will experience an average 2% drop below last year, according to predictions by capital goods producers cooperating in the quarterly McGraw-Hill Machinery New Orders Forecast. The current quarter is expected to be the low point for 1961 with the last quarter averaging about 9% above the comparable quarter in 1960.

Builders of construction and mining machinery see a 7% decline in new business this year and producers of metal-working machinery believe orders will be off 2%. The engines and turbines groups predict a 12% decline while pump and compressor makers anticipate a 5% decline. An increase of 6% is forecast by office machinery producers while general- and special-purpose industrial machinery manufacturers expect no change from last year.

Machinery New Orders Forecast

(1950 = 100)

Total Machinery								
	Seasonally Adjusted	Unadjusted	Pumps & Compressors	Engines & Turbines	Construction & Mining Machinery	Metal-working Machinery	Office Machinery	Other Industrial Machinery
1960								
I..	169...	177...	327...	161...	193...	168...	220...	154...
II..	180...	184...	321...	180...	197...	175...	227...	161...
III..	176...	168...	296...	139...	159...	176...	216...	149...
IV..	162...	158...	303...	128...	138...	179...	221...	136...
1961*								
I..	158...	165...	286...	124...	160...	169...	227...	148...
II..	170...	174...	293...	137...	163...	174...	236...	159...
III..	173...	165...	300...	130...	155...	168...	226...	146...
IV..	176...	171...	307...	143...	157...	175...	254...	148...

*Forecast made in mid-January, 1961.

Source: McGraw-Hill Department of Economics.



WHO ORIGINATED THIS BETTER BELT CONVEYOR?

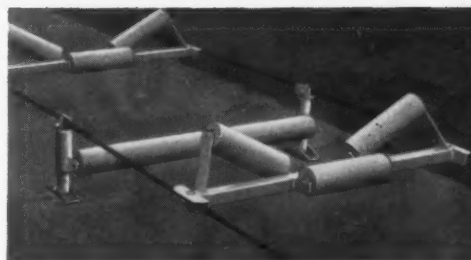
LONG-AIRDOX did— just as they have pioneered so many other major advancements in coal mining equipment and methods.

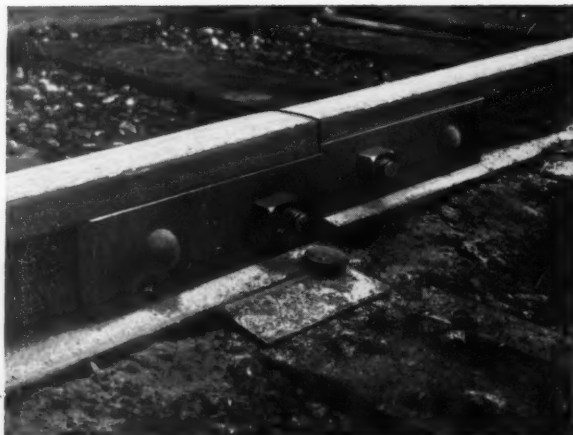
This LONG-AIRDOX development, the "Lo-Rope" belt conveyor,* differs from old fashioned designs in that *the idlers mount on top of the rope side frames and are self-aligning*. Some of the proved advantages of this construction are: belts stay centered as belt motion tips the idlers in direction of travel; conveyor stays aligned—rocker support stands can't walk out of position; fixed deep troughing angle centers load better and increases belt capacity; ropes are completely out of the way, making it safer to handle men and supplies; and belts last longer because they can't be cut by hanger stands.

For more information detailing how you can move more coal more profitably with "Lo-Rope" belt conveyors, write the Long-Airdox Company, Division of Marmon-Herrington Company, Inc., Oak Hill, W. Va.

*U.S. Pat. No. 2,896,774

LONG-AIRDOX





BETHLEHEM COMPROMISE JOINT, DESIGN 976, also called "offset splice bar," is forged and machined from heavy bar stock, for connecting rails of different section, or rails of same section but of different joint drillings.



BETHLEHEM GUARD RAIL, DESIGN 745, is one-piece type for use with wood ties. No loose parts such as clamps, bolts, braces are required. Furnished complete with foot-guards, ready for installation.

How to make good trackwork out of ordinary track

BETHLEHEM HOOK TWIN FROG PLATES grip rail base tightly, distribute track motion over tie, remove direct pull from spikes which anchor the plate. Used in pairs, easily adapted to any frog position or angle.



BETHLEHEM SWITCH HEEL BLOCK JOINT, DESIGN 992, helps maintain heel spread and track gage at the heel end of the switch. Keeps closure rail and switch point correctly aligned, vertically and horizontally.



To have really efficient track you need, first of all, sound planning. Bethlehem stands ready to lend you a wealth of experience that can't be matched anywhere else.

In addition, your haulageway needs a lot of "little things" to make it operate smoothly. Little things like Hook-Twin frog plates, compromise joints, heel blocks,

guard rails, and other accessories of modern trackwork.

Bethlehem engineers will be glad to look over your workings to determine where and how these important accessories might spruce up your haulage track and lower your maintenance costs. Just call or write to the nearest Bethlehem office, or to the address below.



for Strength
... Economy
... Versatility

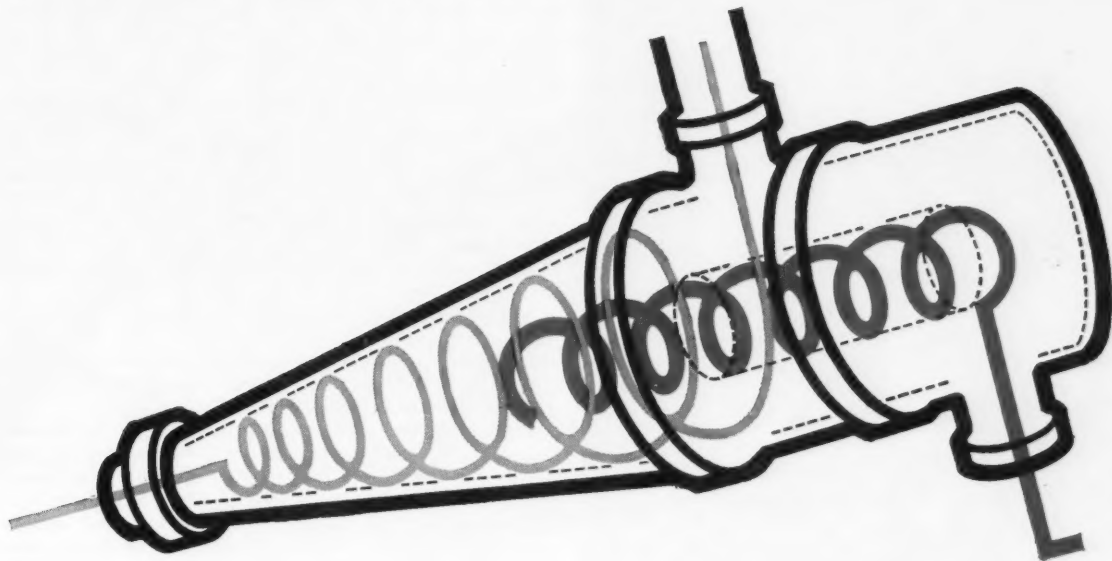
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



DUTCH STATE MINES

HEAVY MEDIUM *Cyclone* WASHER



1960 OPENED A NEW ERA

IN THE PRODUCTION AND MARKETING OF COAL

Installations of the Dutch State Mines Heavy Medium Cyclone Washing System in the United States during 1960 demonstrate new marketing and profit opportunities for the industry.

It is now possible, on a continuing production basis, to meet the critical requirements of public utility and industrial plants for premium quality, uniformly graded coal. *It is being done today in the American market!*

The Heavy Medium Cyclone Washing System cleans fine coal cleaner than by any other cleaning method.

You have positive control and laboratory efficiency on a production scale. You can obtain maximum recovery of present output. You can upgrade to premium quality seams of coal which otherwise are unfit for mining.

The efficiency of the Dutch State Mines Heavy Medium Cyclone Washing System has been proved in more than 40 successfully operating plants in 15 countries throughout the world. It is available in the United States exclusively through Roberts & Schaefer. Installations can be made in your present facilities as well as in a completely new plant.

A Roberts & Schaefer engineer will be glad to give you complete information.

Since 1903, Roberts & Schaefer has pioneered in the engineering of advanced plant design and facilities for the preparation of coal. Introduction of the Dutch State Mines Heavy Medium Cyclone Washer in the American market carries on the R&S tradition of leadership in the field. Roberts & Schaefer provides a complete service covering initial process studies, design and engineering, installation and construction.



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Company

People in Coal



FRANCIS C. BENNETT has retired as superintendent of the Colorado Fuel & Iron Corp.'s Frederick mine in Valdez, Colo., with a remarkable attendance record of never having missed a day's work because of illness or injury during his 58 yr in coal mining.

A native of Staunton, Ill., Mr. Bennett began mining at the age of 16 and by the time he graduated from high school in 1905, had spent three summers in the mines. After attending business college in Danville, Ill., he worked as stenographer for the C&EI R.R. at Danville. Later he worked as secretary to the superintendent of the IGN R.R. in Palestine, Tex., and then became associated with the Denver & Rio Grande in Pueblo who loaned him to CF&I as secretary to the manager of the Fuel Dept.

Mr. Bennett joined CF&I in 1910 and though 1923 worked successively as secretary to the manager of the Fuel Dept., underground coal inspector, assistant superintendent of the Walsen and Robinson mines, assistant superintendent and then superintendent of the Berwind and Tabasco mines.

In 1925 Mr. Bennett became superintendent of the Berwind, Tabasco and Toller mines until they were closed in 1932. He then served as special sales representative out of Denver and Albuquerque and division sales manager in Lincoln, Neb., Pueblo and Colorado Springs. He was appointed superintendent of the Crested Butte mine in 1947, becoming superintendent of Morley mine in 1952. Mr. Bennett worked at the Frederick mine as superintendent in 1954 until his retirement.

CF&I Man Retires With 100% Attendance Record

George H. Hensley has recently been promoted to vice president and **Lester E. Langan** to assistant to the president, Pittston Clinchfield Coal Sales Corp., both to headquarter at the main office in New York City. Mr. Hensley began his coal career in 1938 with the U.S. Steel Corp. and in 1942 became associated with Harlan Wallins Coal Corp. He became assistant to the vice president-administration, Clinchfield Coal Co., Dante, Va., in 1949 and in 1955 was transferred to the sales company in New York as assistant to the president. In his new capacity, Mr. Hensley will coordinate sales in the Lake, New England and Southern territories. Mr. Langan started his career in 1936 with the North American Coal Corp. and in 1943 went to work for C. H. Sprague & Son Co. In 1952 he became a salesman for Pattison & Bowns and in 1954, when Pittston Clinchfield was formed, he was transferred to the New York office.

Mountaineer Coal Co. Div., Consolidation Coal Co., has announced the following personnel changes: **R. H. Quenon** has been appointed superintendent, Loveridge Mine, Fairview, Marion County, W. Va.; **Harry S. Turner** has been named superintendent of Consol No. 93 Mine, Jordan, Marion County, W. Va.

John Lester Zimmerman, Cadiz, has been appointed chief of the Ohio Division of Mines for the term ending Feb. 5, 1967. Mr. Zimmerman succeeds the late **Dominic Stanchina** of St. Clairsville.

Clarence G. Greaves has been elected vice president-sales, Emerald Coal & Coke Co., Pittsburgh, Pa., succeeding **W. M. Achhammer**, who retired as of February 1. Mr. Greaves has been associated with Emerald Coal & Coke Co. since 1946 and previously had been employed by the Pittsburgh Coal Co. He is also a vice president of J. H. Hillman & Sons Co. in charge of brokerage coal sales.

Association Activities

Mid-West Coal Producers Institute, Inc. elected the following officers at its annual meeting held Jan. 25-28: chairman of the board, **Frank Nugent**, president, Freeman Coal Mining Corp.; president, **H. C. Livingston**, president, Truax-Traer Coal Co.; first vice-president, **George E. Enos**, president, Enos Coal Mining Co.; second vice president, **H. R. Rutstein**, vice president, Kirkpatrick Mining Co.; third vice president,

S. F. Sherwood, president, Stonefort Coal Mining Co., Inc.; treasurer, **J. M. Morris**, president, The United Electric Coal Cos.; secretary and manager, **J. E. Tobey Jr.**; and assistant secretary-treasurer, **Martha A. Terleke**.

Highlight of the meeting was presentation of a Service Award to **Fred S. Wilkey** who retired in December, 1960, as secretary of the Illinois Coal Operators Association after 34 yr of continuous service.

Obituaries

Harold W. Livingston, 50, administrative vice president, Clinchfield Coal Co., passed away Jan. 13. Before joining Clinchfield Coal in 1947, Mr. Livingston had been connected with several coal companies in Kentucky and an Oak Ridge, Tenn., engineering firm.

James M. Cook, retired vice president and general superintendent of Imperial Coal Corp., died Jan. 28 at the age of 83 in Memorial Hospital, Johnstown, Pa., after a brief illness. Mr. Cook had been associated with Imperial Coal for more than 30 yr at the time of his retirement in 1948. He had been vice president in charge of operations from 1928 to 1948.

Better products, *faster*, from your National Seal distributor:



National Oil Seals protect your investment!

Nationals keep lubricant in, dirt out of bearings in your expensive machines. You have a big investment in your machines and the longer they stay on the job *without repairs*, the faster your profits roll in. National seals keep grit, water, and corrosion—the bane of bearing life—under positive control regardless of conditions.

National Oil Seals in Micro-Torc® leather or Syntech rubber come in standard or made-to-order sizes. *National*

Micro-Torc leather is impregnated only part-way through. The coated side seals perfectly; the untreated porous side absorbs the lubricant that leather needs to stay flexible, run cooler and longer. *National Syntech synthetics* are prescription-blended to meet the most exacting conditions of temperatures, shaft speeds, and other critical factors.

Never reuse old seals. Call your National Seal distributor for the new and better replacement.



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Better products, faster, from your Bearing Specialist:



For smoother "coaling," choose smoother rolling Bower Bearings

Downtime means lost production—and you can't make it up! That's why it's so important to choose only the very best components for your mining equipment.

Take roller bearings, for example. You look for dependability, minimum wear, and longer service life. And that spells Bower. Bower Roller Bearings (straight and tapered) are designed to meet the gruel-

ing demands of the mine—and then some! In everything from conveyor idlers and continuous miners to shovels and shuttle cars, Bower Roller Bearings stand up longer, hold maintenance to a minimum.

Need bearings replaced in a hurry? For the finest, *f-a-s-t-e-s-t*, the man to call is your Bower Bearing Specialist.



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DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN



Coal Abroad

ECSC '59-'60

Picture

Coal production in the six-nation European Coal & Steel Community totaled 233.9 million metric tons in 1960—a drop of only 0.4% from the level set in 1959.

The slight difference, according to the ECSC spokesman in Luxembourg who reported the figures, is due to an increase in German and Dutch production which more than made up for lower output in France and Belgium.

A reduction of 9.2% or 54,000, in the number of miners employed in ECSC mines brings total reduction in the work force since the beginning of the coal and steel common market to 170,000 miners, or 23.4% fewer than the original number.

Germany (leading ECSC producer) raised coal output in 1960 by 454,000 tons, or by 600,000 if production of small Saar mines is included, to reach a total of nearly 142.3 million tons. Stocks were reduced by 3 million tons, or 40%. Tonnage lost through unemployment in the mines was only 160,000 tons, compared to 5 million in 1959.

The Netherlands produced 12.5 million tons during 1960, a rise of 518,000 tons over 1959. This is the highest Dutch production in ECSC history. Stocks were reduced by 24%.

France, despite a further improvement in output per man shift, suffered a drop of 2.9% to hit 55.96 million tons. Production lost through unemployment totaled 1.8 million tons—over a million tons more than in 1959—and stocks rose by 21%.

Belgium experienced a drop of 1.5% from the '59 level due solely to strikes at year end, putting production at 22.4 million tons for 1960. Loss of production through unemployment dropped 53%, while pithead stocks were reduced by 3.44 million tons, or 12%.

Oil Catching Up

Preponderance of coal is dwindling fast on the European continent and oil is now on the verge of catching up with coal consumption.

According to first estimates of the High Authority of the European Coal & Steel Community, the share of hard coal in total energy consumption decreased from 71.7% in 1950 to 62.8% in 1955 and 52.4 % in 1960.

Energy consumption for 1960 in the

six countries of the community climbed to 460 million tons hard coal units. Of the 29-million-ton increase over 1959, only 7.1 million tons or 24% were accounted for by hard and soft coal but roughly 60% by oil.

Canada Buys British Dragline

A giant electrically-driven walking dragline now nearing completion at the Waterside Works of Ransomes & Rapier Ltd. at Ipswich, England (Newton, Chambers & Co., Ltd. subsidiary for Canada) and costing \$1½ million, has been ordered by Calgary Power Ltd., Alberta, Canada.

It will be used for removing overburden on top of 750,000 tons of coal required annually for power stations in the vicinity of Edmonton, capital city of Alberta, and chiefly for the Wabamun Power Station now in course of erection.

Identified as the "Rapier W-1350," this dragline weighs 1,400 tons and operates a 33-cu-yd bucket capable of excavating and carrying 50 tons of material at a time at a radius of 215 ft. Alberta Coal Ltd. will have the responsibility of erecting and operating the machine.

The drag drum and four sets of gear which make up the balanced drive weigh no less than 18 tons and the whole unit is mounted in antifriction bearings.

A second order for a similar machine to be operated in the Maritime Provinces of Canada was obtained by Ransome & Rapier last December.

OVERSEAS FLASHES

ITALY—The Italian Ministry of Industry's Coal Committee has approved the imports of 2,590,000 metric tons of pit coal which is the estimated national requirement for the first quarter of 1961. This exceeds, by about 140,000 metric tons, imports for the last quarter of 1960. During the first 9 mo of 1960 total coal imports rose about 1,325,000 metric tons over the quantity imported during the same period of 1959, or an increase of 20.7%, due mainly to the augmented demand of the Italian metallurgical industry.

HOLLAND — The Netherlands States Mines is to bring on the domestic market a new kind of coal called synthracite. Synthracite is fine, purified anthracite mixed with other components and put through several special processes which structurally changes the material. Due to

(Continued on p 44)



grip. RUSLON* PVC CONVEYOR BELTS

grip pulleys tight at low tension!

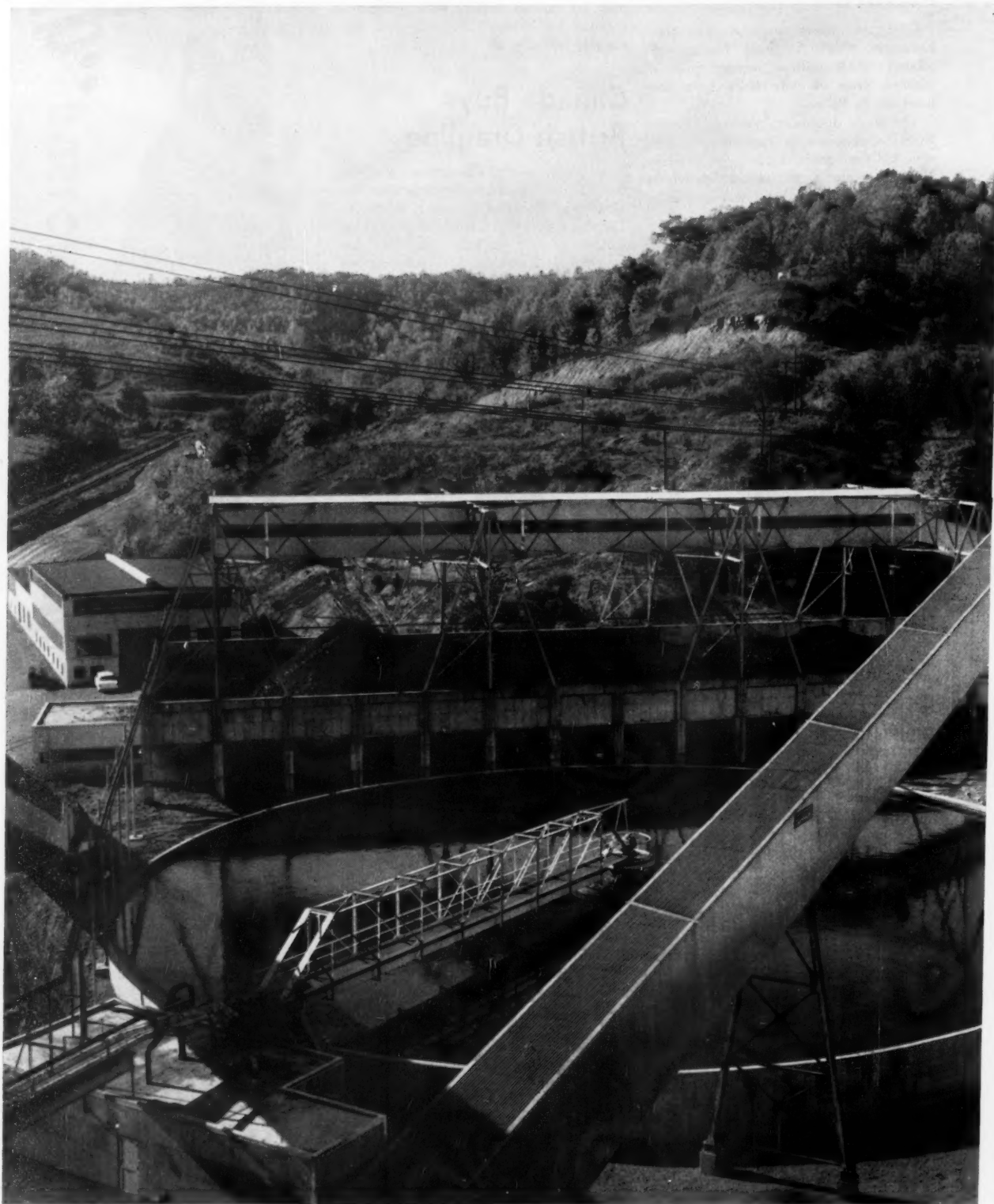
Reason: far greater coefficient of friction than laminated belting. No surge, no slip, no jump. Ruslon Belts hold onto splices with the tenacity of an alligator. The interlocking weave does it. Ruslon patented rough plastic for better grip, carries coal reliably and economically at better than 500 feet per minute. Write for Bulletin.

*The Trademark of Ruslon Fenoplast Conveyor Belts

THE RUSSELL MFG. COMPANY, MIDDLETOWN, CONNECTICUT
Distributed By West Virginia Belt Sales Inc. • Mount Hope, West Virginia

HOW MAJOR EAST COAST MINE HANDLES

The Dorr Type S Thickener is a proven unit now widely used throughout industry.



BLACK WATER IN A CLEAN STREAM AREA

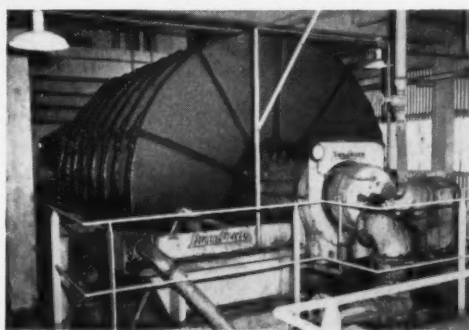
Dorr Thickener and two American Disc Filters close preparation plant water circuit

Located in an area free of industrial pollution, preparation plant water handling could have presented a serious problem at this large Northern West Virginia mine. It was imperative that no black water bled back into the creek. The problem was solved — and the water circuit closed — by the use of a 170' Dorr thickener in conjunction with two 10'6" dia. by 10 disc American filters.

Primary feed to the thickener is the overflow from the table-refuse drag tank plus other black water. 65 tph makeup water is added at the thickener — approximately the amount evaporated in the heat drying plant, giving a makeup rate of approximately 275 gpm. Overflow is piped to the plant for various uses. Underflow from the thickener goes to the two American Disc filters. Cake from the filters

can be sent to the flash dryers or can be diverted to refuse.

Dorr-Oliver can supply a full range of equipment for coal drying, cleaning, recovery and water clarification. For complete information write Dorr-Oliver Incorporated, Stamford, Connecticut.



American Disc Filter features extremely large filter area for space occupied.

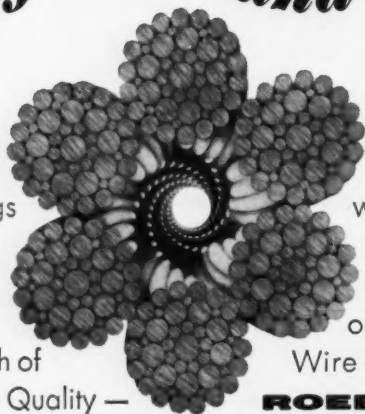
 **DORR-OLIVER**
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

We put a lot of work into it
You get a lot of work out of it



quality inside and outside

Take a good look at the pictures. They show you where your savings really start—with the inner and outer uniformity of wires and strands. Unseen, but of utmost importance is the extra high strength of Roebling Royal Blue Wire Rope. Quality —



inside and outside — is the extra working factor that pays off on the job for you. Find out more from your wire rope distributor, or write for free booklet to Roebling's Wire Rope Division, Trenton 2, N. J.

ROEBLING 

Branch Offices in Principal Cities
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THIS IS MSA: Illumination • Electronic Communication and Control • Rock Dusting and Dust Collecting • Fire Fighting Equipment • Respiratory Protection • Artificial Respiration Equipment • Personal Protective Wear • First Aid Equipment • Permanent and Portable Instruments

Coal comes quicker with increased working light

Now Edison Model S Electric Cap Lamps give you *more* working light than any other cap lamp.

They're throwing *more* light on the subject of man-hour productivity, too. This is the safe lamp for the miner . . . the dependable lamp for you.

Miners themselves come up with the best reasons why: 15% increase in working light . . . small lightweight headpiece . . . 400 hours bulb life in each filament . . . longer battery life . . . clear, sharp spot every time . . . and so it goes.

As for charging: no new charging racks required . . . takes either constant current or constant voltage . . . over-charging or under-charging won't affect battery life . . . never a labor-scheduling problem.

Such an increase in working light can cast a favorable image on your operating sheet. Ask your MSA Representative about it. Mine Safety Appliances Company, Pittsburgh 8, Pa. In Canada: Mine Safety Appliances Company of Canada, Ltd., 500 MacPherson Avenue, Toronto 4, Ont.

MSA



Current Coal Patents

Oliver S. North
Patent Research and Abstracting
Washington, D. C.

Vortical separator, Z. Vane, Jan. 10, 1961. Method and apparatus for the centrifugal separation of mineral particles, e.g. coal, from a column of fine solids suspended in a carrier fluid spinning in free vortex wherein the "sink" particles, stratified in density layers along the outer periphery of the column, are reflected and shifted in a radially inward

direction by the action of an additional carrier flow coming from outside in the direction of the radius of the vortex. No. 2,967,618.

Screen, L. C. Bixby, Jan. 10, 1961. Screen construction especially suitable for use in the washing and classifying of coal. The various parts of the screen are interlocking, so as to provide a rugged and durable assembly. The screen can be readily disassembled for repair and replacement of parts. No. 2,967,620.

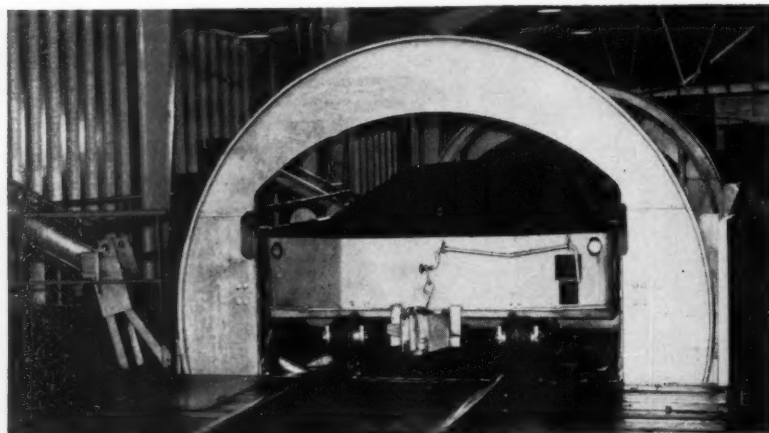
Method of continuous low-seam short-wall mining using rotary-auger cutters, A. C. Wilcox, Jan. 10, 1961. Continuous mining method operable on the short-wall mining principle to remove coal from a face both longitudinally and transversely in low-seam mines. A pair of parallel oppositely-pitched rotary augers is used. No. 2,967,701.

Lime feeding apparatus, H. D. Letts (assigned to Tasa Coal Co., Pittsburgh, Pa.), Jan. 17, 1961. Design for a relatively lightweight apparatus for feeding a lime slurry into acid waters, e.g. waters occurring in and around coal mines and mills, for the purpose of deacidifying the waters. A metered quantity of the lime slurry is fed to the water at frequent intervals without use of a power source. No. 2,968,310.

Mine door latch, D. F. Montgomery, Jan. 17, 1961. Design for a mine door latch which will automatically latch the mine door to a slam post upon striking the slam post. The latch retains the door in open position for a short time to permit a mine locomotive and cars to pass through, and then releases it to return to its normal closed position. No. 2,968,507.

Mine haulage vehicle, M. L. Hoover and J. W. Woolf (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Feb. 7, 1961. Design for an improved mine shuttle car wherein the car body can be elevated or tilted relative to the supporting wheels either to increase the space between the compartment bottom or the rear deck and roof during the loading operation and to raise the front discharge end of the car during the unloading operation. No. 2,970,664.

Coal treating process, M. C. Chang and J. Dasher (assigned to Crucible Steel Co. of America, Pittsburgh, Pa.), Feb. 7, 1961. In a froth flotation process for the beneficiation of a fine-coal slurry, the slurry is passed through two sets of parallel-connected cyclone separators, with the respective sets of separators being connected in series. The diameters of the first set are larger than those of the second set, whereby the bulk of the underflows from the respective sets are in different size ranges. The underflows are floated separately, and their froth concentrates combined and filtered to produce a metallurgical coal. Cell tailings and cyclone overflows are combined and passed to a thickener. Sludge underflow from the thickener is discarded with or without filtering; if filtered, the filtrate is combined with the overflow and recycled through the coal washing process which produces the original slurry. No. 2,970,689.



dumping economy...

Differential Rotary Car Dumpers (patented) used with Differential Mine Cars

Cost less: to purchase / to install / to operate / to maintain

Want proof? Just ask for it. First installation was made in 1946 and dozens more have been made since 1950—six for repeat customers.

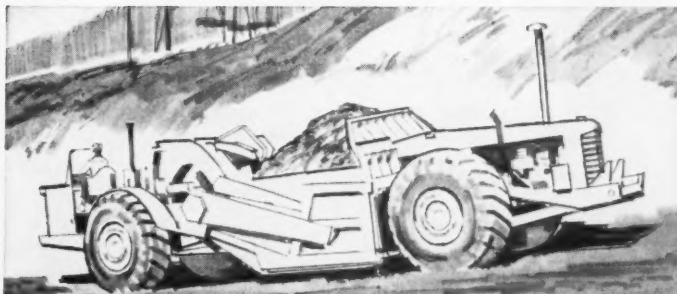
Want speed? Spot cars with your locomotive, then complete dumping cycle—180° over and 180° back—in five seconds. Compressed air starts the operation—then gravity takes over. For long storage bins, dump several cars at once—capacities up to 2,000 tons per hour.

where can you match it?

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Pioneers in
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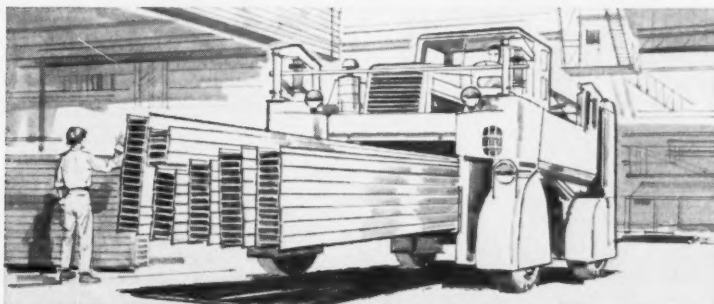


ALLISON smooths out starts TORQMATICALLY



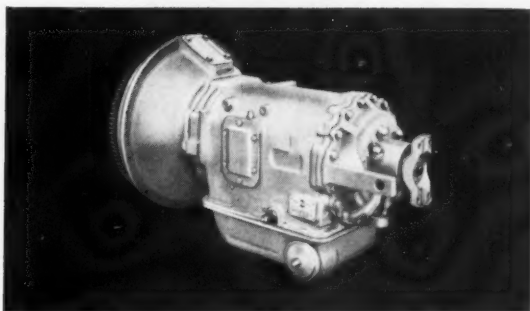
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"Twin Power"—made possible by twin Allison CT-3340 TORQMATIC DRIVES in this Euclid TS-14 scraper—makes every operation smoother. Production is as much as 100% higher, cost per yard 50% less, than for scrapers pulled by tractors.



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"Easy Does It" for 30-Ton Loads—Equipped with an Allison CT-3340 TORQMATIC DRIVE, this Gerlinger Material Handler starts 20- and 30-ton loads slick as a whistle for an Eastern steel producer. Unit works 24 hours a day, five days a week, has cut steel handling costs 50%.



IN ANY 125-175 H.P. UNIT

Small off-highway trucks, fire trucks, airport tow tractors, graders—a whole long list of equipment becomes better equipment with an Allison CT-3340 TORQMATIC DRIVE.

This torque converter-hydraulic transmission team has 4 speeds forward, 2 reverse—converter-driven PTO—drive line parking brake—full power shifts at all speeds—optional lockup clutch—can be direct or remote engine mounted.

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Allison 
TORQMATIC® DRIVES

The world's most complete line of hydraulic drives

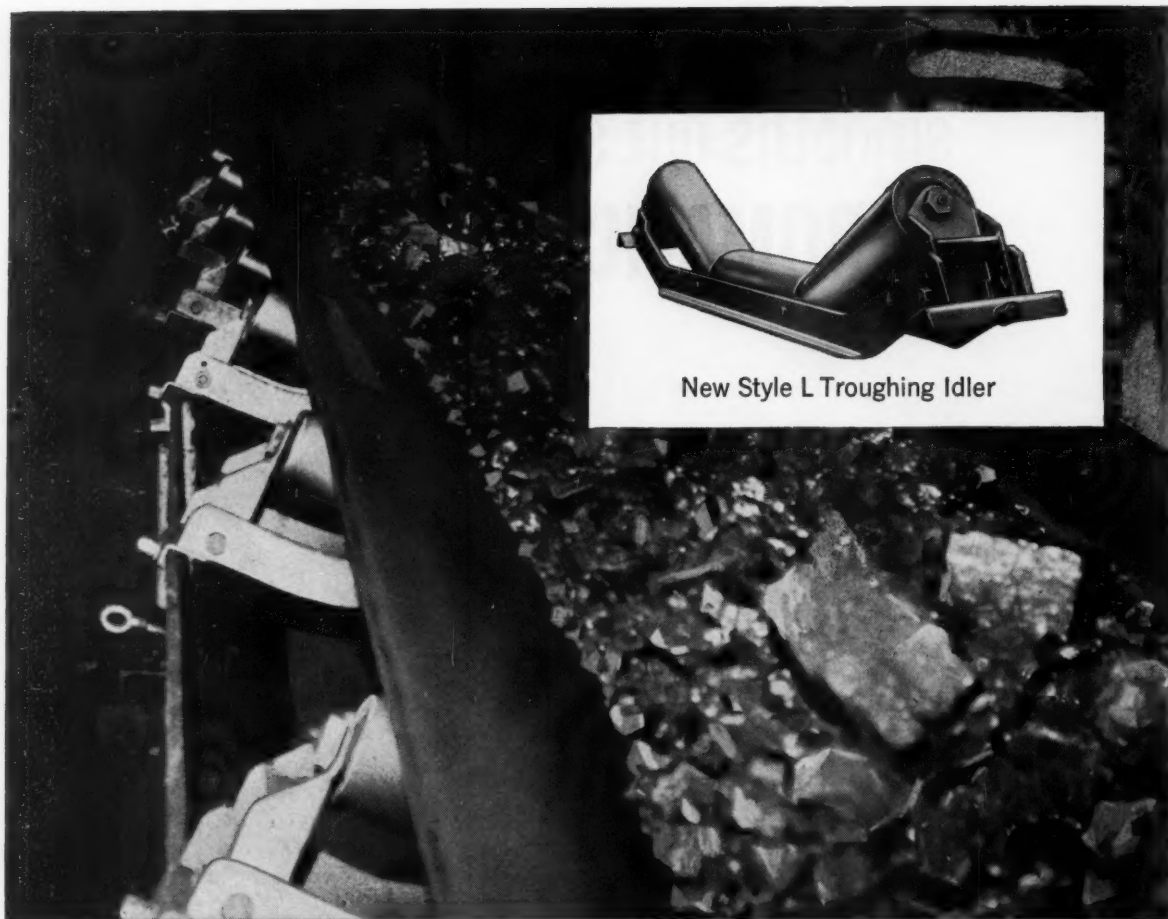
Over 980 Models Used by 108 Manufacturers in
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DESIGN RANGE:

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- Belt widths of 24", 30", 36", 42", 48".
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- Above and below ground installation.

MONEY-SAVING HINTS! New pocket-size H-R booklet, packed with useful information on mining belt conveyor operation and maintenance. Write Hewitt-Robins, Stamford, Connecticut for Bulletin 3-49.



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KW-Dart 605

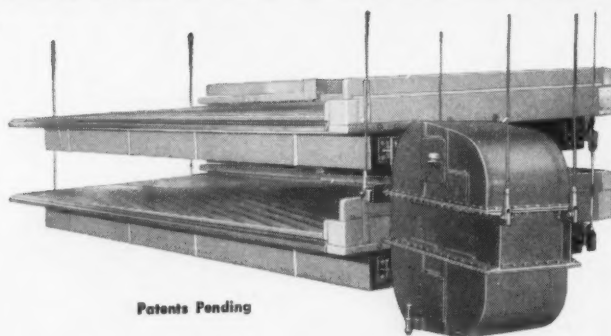
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Patents Pending

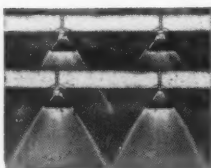
Double Deck Your Coal Washing Section to Save New Plant Cost

Here is the washing table that can do it the CONCENCO® 77 Twin Deck table!

Here is a table that operates with two identical decks in floating suspension, one over the other. Each deck is exactly as efficient, exactly as productive as our unexcelled single deck table.

That means you can increase your capacity one table at a time or double deck your entire section, thus doubling your capacity in any given unit of floor space, without spending a dime on new building construction.

There are other economies, too . . . such as the reduction of impact to the building structure, because this table operates in floating suspension. Power cost per table is lower also. For complete information, send for Bulletin 77.



CONCENCO Spray Nozzles

These handy nozzles are simple, flexible and economical. All you do is drill over-size holes in spray line, one per nozzle, clamp on and get results. They can be definitely aligned for washing, sluicing or spraying according to need. They are removed or replaced in a moment's time.

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Coal Abroad (Continued)

this, it assumes special characteristics: great reaction, i.e., quick ignition and quick flaming up; fire that is easily regulated, has high-burning quality and a complete burning to almost no ashes. Synthracite is said to be better or at least as good as the finest anthracite and less costly.

INDIA—Faced with a coal shortage affecting production of engineering and chemical industries, New Delhi has lifted the firm edict imposed to date on private collieries and is encouraging them to open new mines in non-contiguous areas within their leaseholds. Private collieries will need about \$42 million for expansion allowed them in the Third Five Year plan period, that is, 16 million tons. New Delhi is willing to assist in providing such foreign exchange, will subsidize expansion of "weaker units" and has already begun negotiations with the World Bank. The 1965-66 coal target is 97 million tons, or 37 million tons over the 1960-61 target of 60 million tons. Production in 1960 fell short by around 10 million tons of the Second Plan target and this shortage has severely affected the steel industry.

Considerable foreign assistance has been offered India to develop its coal industry during the Third Plan period by the United Kingdom, West Germany, France and the U.S. following visits to India of coal experts from these countries. The British National Coal Board has offered to develop three underground deep coal mines, while the U. S. has offered to develop some open cast mines. West Germany is willing to put up and maintain a workshop for coal mining equipment. The French offer largely relates to technical assistance.

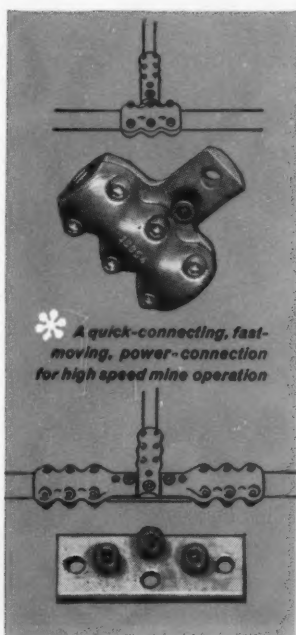
WEST GERMANY—A major electrification program calling for a switch from coal to electricity for about 2,900 mi of railways within 3 yr has been announced by the German federal railways. However, a good 80% of the electricity will come from coal power plants; the remaining 20% will be generated by hydropower plants. This would mean a total of 5,280 mi or 28% of the entire West German railway network, carrying over half of the railway traffic load, will be electrified in the future.

AUSTRALIA—New South Wales coal production in 1960 rose by more than two million tons to 17,735,000 but employment dropped from 13,265 to 12,928 while at the end of 1958 it was a hefty 14,349. All districts showed production increases but southern districts led with a rise of 953,000 tons. Exports overseas increased from 753,200 to 1,552,700 tons of which Japan took 1,373,000 tons. Australian coal exports in 1961 are expected to show further increases.

O-B Designs for Mining Men:

RESULT: you can make connections

**between seven popular sizes of copper or
aluminum cables . . . joining the same or
different sizes . . . either copper or aluminum**



FAST . . . The new O-B Cable Connector makes or breaks a cable connection simply with the turning of two cap screws. These sturdy fittings are especially designed for sections that are picked up and moved frequently.

VERSATILE . . . You can add or remove sections of cable to keep pace with fast machinery. You can make tap-offs, 3-way connections between cables, or a variety of switch and panel arrangements . . . all in minutes!

SIMPLE . . . Your O-B Cable Connectors give you the advantages of "built-in" cable connections that hook-up or disconnect simply. No specialist needed . . . saves time and labor on the job.

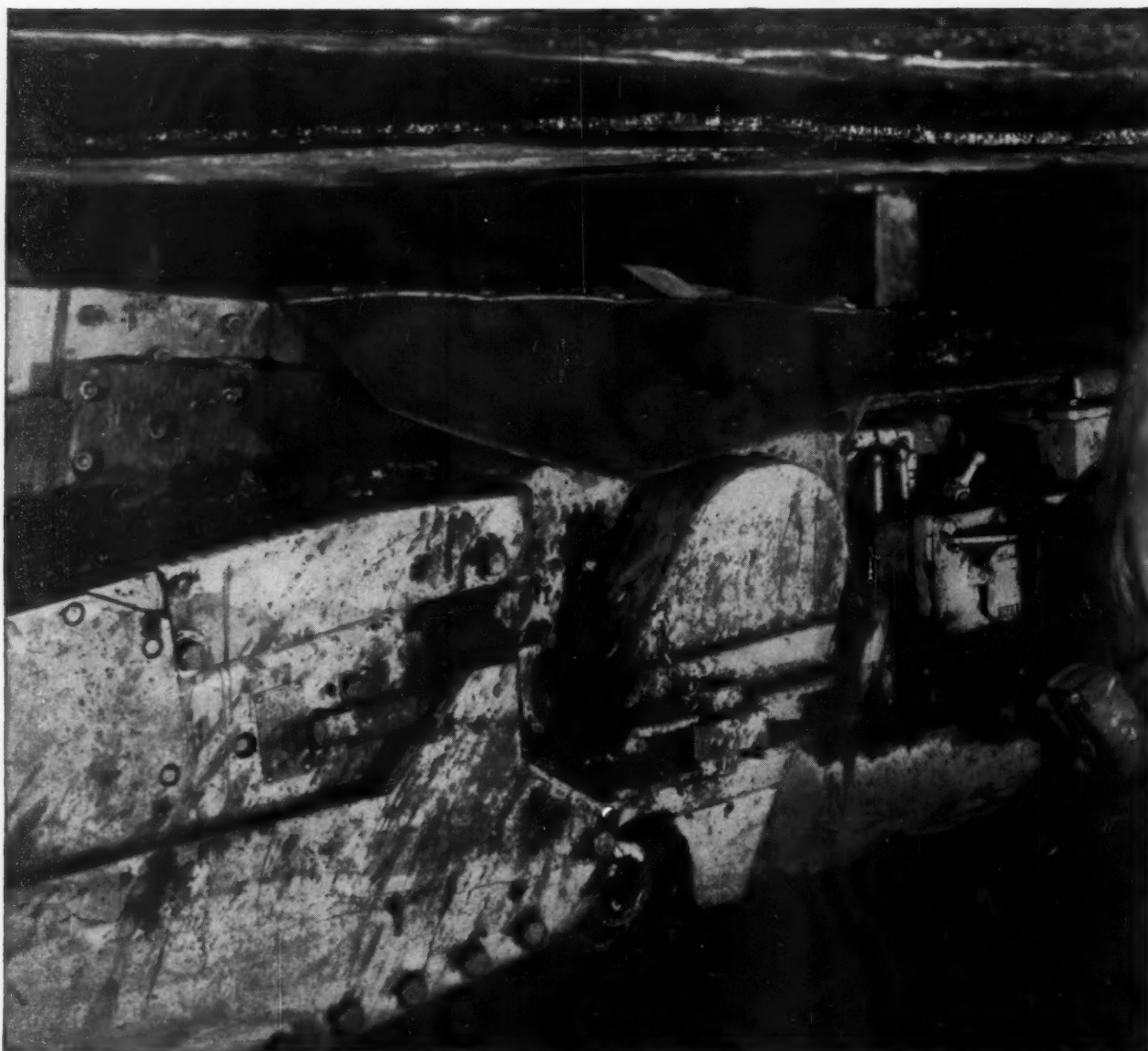
Write us . . . or see your local O-B sales-engineer to order the new O-B Cable Connectors. You'll find—as others have—that they make moving easier, faster, and considerably cheaper. OHIO BRASS COMPANY—MANSFIELD, OHIO, Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

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EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY
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FOUR MINES REPORT THIS HIGH PRODUCTION WITH JEFFREY TYPE 81 LOADERS IN LOW COAL

	Mine A	Mine B	Mine C	Mine D
Seam Height	37" to 42"	34" to 45"	32" to 40"	38" to 46"
Average Shift Production	405	425	415	440
Peak Production	672	687	718	700

ARE YOU GETTING THIS KIND OF PERFORMANCE?



Ask Jeffrey mining engineers to help you check your loading requirements. If your seam is of medium height, a Jeffrey Type 81 Loader may enable you to match the figures shown. Rated at 10 tons per minute, this Loader provides high production at low cost.

Jeffrey Loaders are available in heights from 25" to 48". They are the crawler-mounted, gathering arm type and are demons for hard work in medium height coal seams—operate equally well in conventional or continuous mining systems, digging and loading out a shot coal face or picking up the discharge from continuous mining machines.

Electrical equipment can be either direct current or alternating current.

YEARS OF EXPERIENCE with all kinds of mining conditions have given Jeffrey engineers the know-how to assist you in achieving low cost production, employing the Jeffrey proven line of mining machinery. For this help, write your nearest district office as listed, or write The Jeffrey Manufacturing Company, 912 North Fourth St., Columbus 16, Ohio.

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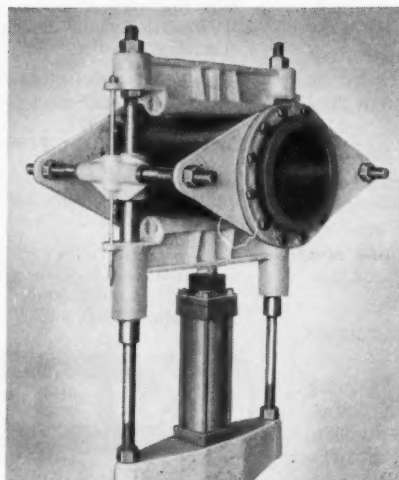
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TRANSMISSION MACHINERY... CONTRACT MANUFACTURING



AUTOMATED Hydral-60 PINCH VALVE SYSTEMS

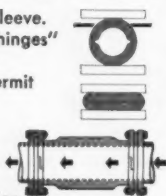


Controlled circuitry for any operating requirements

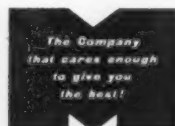
- The Massco-Grigsby Hydral-60 System consists of one or more pinch valves with a single automatically operated hydraulic pump.
- Hydraulic pump may be operated by electric motor or by air from normal plant supply system.
- Valves may be the same or different size.
- Valves in the system may be operated simultaneously or independently.
- Control valve may be manual or solenoid.
- Valves are self-supporting and may be operated in any position from horizontal to vertical.
- Valves may be coordinated and interlocked with other plant equipment to automatically control tank levels, rate of flow, etc.
- Valves may be independently controlled for normal or rapid closure.
- Valves may be held fully open, fully closed, or at intermediate positions.
- Remote control to meet individual requirements.
- Controls may be included for automatic emergency operation.
- 3" to 14" I.D. sizes, with 50, 100, and 150 psi line pressure ratings.
- Temperatures to 200° F.

Advantages of Massco-Grigsby Pinch Valves

- Rubber, neoprene and special compounded rubber sleeves for corrosive and abrasive pulps and liquids.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.
- Unobstructed flow eliminates high friction loss and prevents contamination.
- Split flanges and patented Flex Seal ends assure perfect seal.
- Rugged, heavy duty construction for most severe service and long life.
- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



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News Roundup (Continued)

Permissible Equipment

The January 24 Federal Register carried the final U. S. Bureau of Mines Schedule 31 governing the "Permissibility of Mobile-Diesel Powered Transportation Equipment for Gassy Noncoal Mines and Tunnels."

It restricts the use of electrical components on such equipment to totally-enclosed electric headlights, which means that only diesel-mechanical equipment can be rated permissible under the Schedule.

However, the USBM has been devoting considerable effort to the development of continuous methane monitoring system, and when regulations covering such a system are published, Schedule 31 will be amended to include diesel-electric equipment if an approved continuous methane monitoring system is incorporated in the equipment design.

Study Air Pollution

A nine-man committee will be named to assist the Pennsylvania Air Pollution Commission in tackling the problem of burning refuse piles in the state.

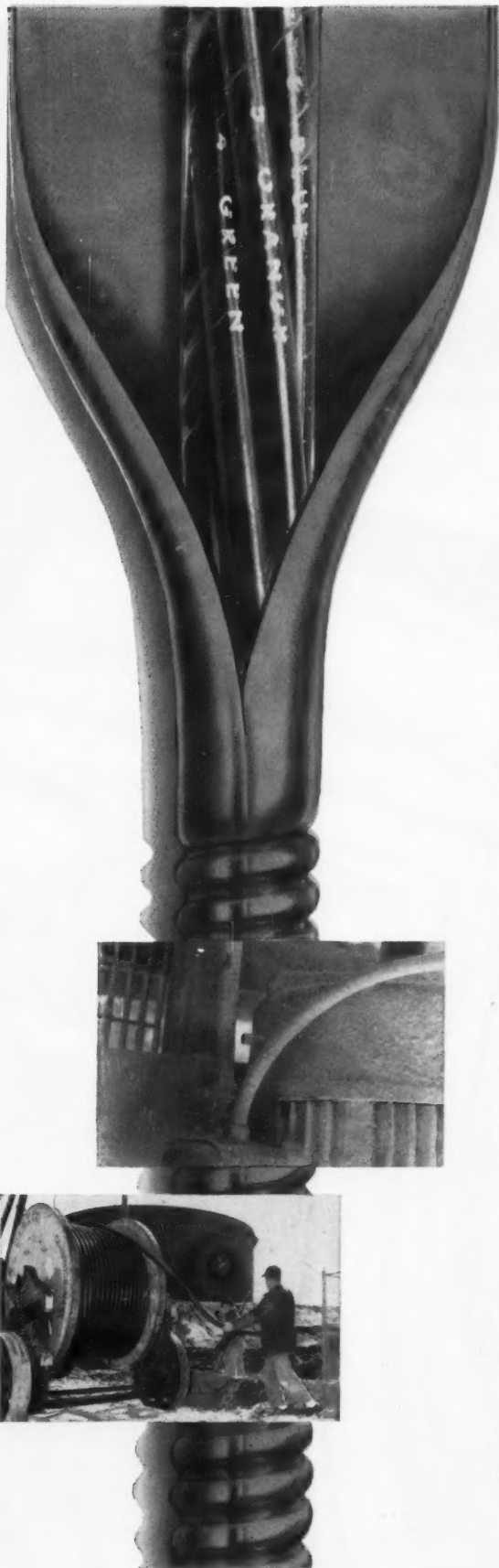
The committee, which will act in an advisory capacity, will consist of a representative from each of the four bituminous coal operators' associations, the anthracite coal operators' associations, a representative from steel company-owned mines and a representative from the UMWA, the State Health Dept. and the State Dept. of Mines & Mineral Industries.

Bituminous Output

YEAR TO DATE	PRODUCTION
Feb. 11, 1961	43,285,000
Feb. 13, 1960	52,640,000
1961 output 17.8% behind 1960	
WEEK ENDING	PRODUCTION
Feb. 11, 1961	7,360,000
Feb. 13, 1960	8,290,000

Anthracite Output

YEAR TO DATE	PRODUCTION
Feb. 11, 1961	2,506,000
Feb. 13, 1960	2,362,000
1961 output 6.1% ahead of 1960	
WEEK ENDING	PRODUCTION
Feb. 11, 1961	440,000
Feb. 13, 1960	345,000



Only **C-L-X**[®] Continuous Lightweight exterior **Sealed Cable Systems** **by Simplex** **Can do so Many Jobs** **so Well**

Simplex C-L-X is a packaged combination of cable and an extremely pliable, corrugated metal sheath. It requires no separate duct or conduit regardless of environment. It is available with steel sheath and plastic jacketing; and with copper or aluminum sheaths, with or without plastic jacketing.

C-L-X Cuts Installation Costs

By using a single length of 3-conductor 15KV C-L-X for both underground and aerial use, a Southeastern utility company saved more than 20,000 dollars from what it would have cost for a complete underground duct system.

Resists Chemical Attack

Conduit life in this company's calcium chloride reclamation building was only 6 to 9 months. The conduit was replaced with a C-L-X cable system which — after two years of operation, shows no signs of deterioration.

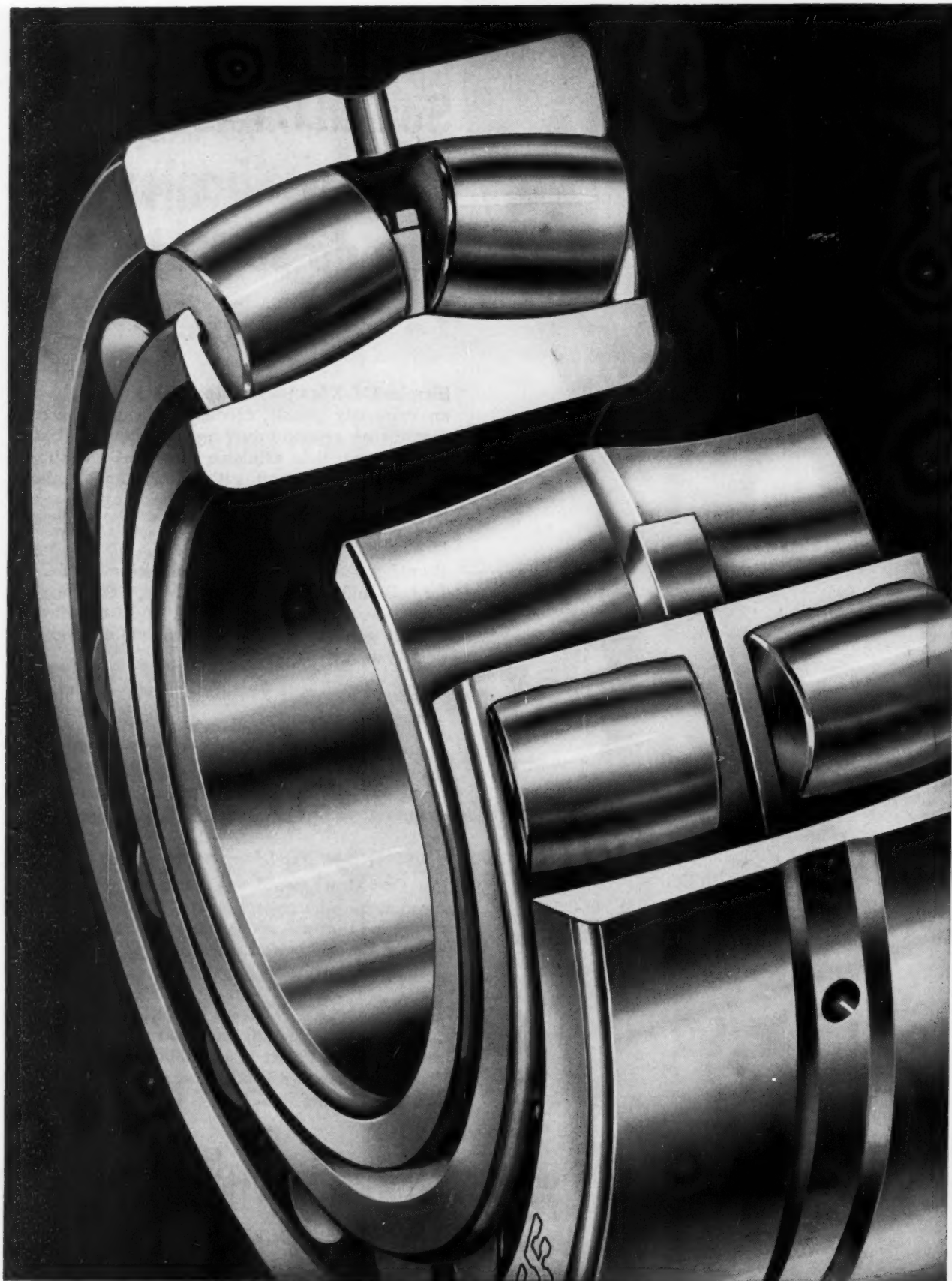
Protects Against Liquids and Gases

An East Coast petroleum tank farm used a C-L-X 8-conductor cable protected with PVC for direct burial in ground that was saturated with oil, gas and water. Result: Perfect performance at a sizeable savings over conduit systems.

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SIMPLEX WIRE & CABLE CO

CAMBRIDGE, MASSACHUSETTS



Now SKF has improved the spherical roller bearing it invented!

This new spherical roller bearing offers even higher capacity than SKF's original, self-aligning bearing — and meets the needs of today's faster, more productive machinery. In some cases, the increase in capacity is as much as 54% — corresponding to more than 4 times longer service life!

Here's how these improvements have been obtained:

1. Eliminating undercuts and integral flanges — helps provide space for larger rollers and longer effective contact between rollers and races.

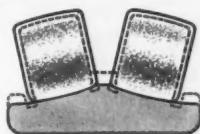


Fig. 1



Fig. 2

2. Using symmetrical rollers, unrestricted by flanges — ensures uniform load distribution over the roller length at all times, even under heavy thrust load.

3. Using an axially floating guide ring — provides effective roller guiding, and minimizes friction at roller ends.



Fig. 3

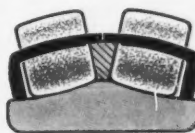


Fig. 4

4. Using a strong "window-type" cage for each row of rollers — helps ensure dependable operation over a full range of loads and speeds.

5. Placing a lubricant duct in the center of the outer ring — helps channel lubricants directly to the rollers and push contaminants away.

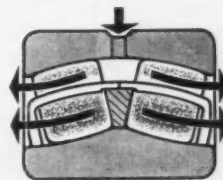
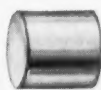
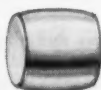


Fig. 5

For full details on this new high-capacity spherical roller bearing call the nearest SKF sales office or authorized SKF distributor listed in the yellow pages of the telephone book.

5931



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EVERY TYPE—EVERY USE

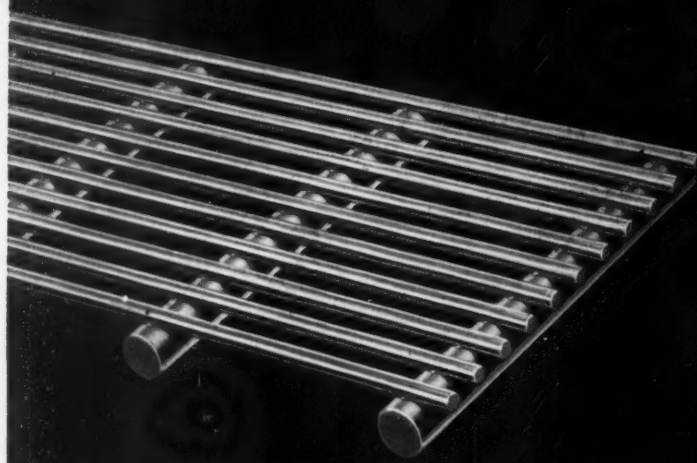
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News Roundup (Continued)

Soft Coal Used As Scientific Standard

Bituminous coal has been selected as a precise scientific standard as a result of cooperation between researchers at the USBM Pittsburgh Coal Research Center and Varian Associates Inc., Palo Alto, Calif.

Specifically, the researchers have discovered that vitrain—a major constituent of bituminous—from the Pittsburgh seam can be used as a basic comparison standard (in measurements with an electron paramagnetic resonance spectrometer) for determining the free-radical content of other substances. Free-radical is defined as any chemical substance with an unpaired electron. Due to its unpaired electron, the free-radical is magnetically out of balance, thus making detection by an EPR spectrometer possible. Free-radicals are normally short-lived or unstable. Pittsburgh bituminous vitrain was selected as a standard because it is readily available, has a high free-radical concentration and exhibits great stability.

Loomis Reopens

Glen Alden Coal Co. has announced it will reopen the No. 4 Shaft of Loomis Colliery in Hanover Township, Pa.

The shaft was closed 3 yr ago due to unfavorable market conditions. An increased demand for anthracite brought about by the recent prolonged cold weather and a dwindling stockpile (from 200,000 tons a few months ago to 18,000 tons) resulted in the decision to resume operations.

Between 175 and 200 men eventually will be employed at the operation which it is expected will start production in one or two months.

Asks Dismissal of Antitrust Suit

U. S. Dist. Judge Leslie R. Darr, Chattanooga, Tenn., was asked to dismiss a \$30 million antitrust suit (*Coal Age*, Feb., 1961, p 26) filed by a group of small coal operators in southeast Tennessee against the United Mine Workers Union and its welfare fund.

Lawyers for the union and the fund trustees, headed by former UMW President John L. Lewis, based their motion primarily on technical grounds which included one that none of the UMW defendants are residents of Tennessee. They also asked the subpoenas issued in connection with the suit be quashed.

The suit also named the Tennessee Valley Authority, Louisville & Nashville



USS Tiger Brand hoist ropes and boom supports help keep this 25-yard dragline on the job around the clock.

Tiger Brand hoist ropes **last over 1,800 hours on 25-yard dragline**

This big dragline works around the clock—three shifts a day—at the Harmattan Mine of Fairview Collieries Corporation, Danville, Illinois. The twin hoist ropes last over 1,800 hours in this rugged service.

The USS Tiger Brand hoist ropes are two inches in diameter and 450 feet long. They are made of tough Monitor steel which has a reputation for long service on jobs like this.

The upper boom supports are also Tiger Brand—six two-inch diameter galvanized boom support strands 118 feet long. These are noted for their strength and resistance to vibration fatigue. Most of the largest shovels in the country are equipped with USS Tiger Brand Boom Support Assemblies because of their reputation for safety and long service life.

Why USS Tiger Brand is your best buy. Tiger Brand Wire Rope is designed by one of the industry's most capable staffs of wire rope engineers. It is made

by a company that maintains the most complete research and manufacturing facilities in the steel industry. When you buy Tiger Brand you get the right rope for the job. And your installation is no further away than a phone call to experienced American Steel & Wire field service representatives.

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This mark tells you a product is made of modern, dependable Steel.

THE USEFULNESS OF A



6 or 8-yd. Lima Type 2400, shown stripping coal in Pennsylvania, also available with special 10-yd. coal loading dipper.

Toughest mantle rock can't stop Limas

Limas are job-designed and built from the ground up for high output stripping and loading. They remove overburden fast and easy for high-speed loading of coal and ore. These are some of the reasons Lima's big, bold Type 2400 is a high-production mining favorite everywhere:

- **CRAWLERS** — Wide, long for extra stability; steered through air-controlled jaw clutches for easy handling
- **MAIN MACHINERY** positioned to hold counterswing to minimum, allow faster swing
- **DRUMS** — Extra wide, tandem mounted for more cable capacity, longer cable life
- **ANTIFRICTION ROLLER BEARINGS** reduce wear at all important bearing points
- **AIR-CONTROLLED CLUTCHES** are extra large; give instant response
- **TORQUE CONVERTER** reduces shock loading, prevents stalling . . . lengthens cable life, lowers maintenance
- **PRECISION AIR CONTROL** lets operator feel action without fatigue; means more output, greater efficiency

Judge the 2400 for yourself — ask your nearby Lima distributor for a free copy of the 32-page bulletin describing the 2400 in detail . . . or write to us here in Lima.

There's a Lima type and size for every mining operation — shovels to 8 yd.; draglines variable; diesel or electric.

LIMA Construction Equipment Division, Lima, Ohio
BALDWIN · LIMA · HAMILTON

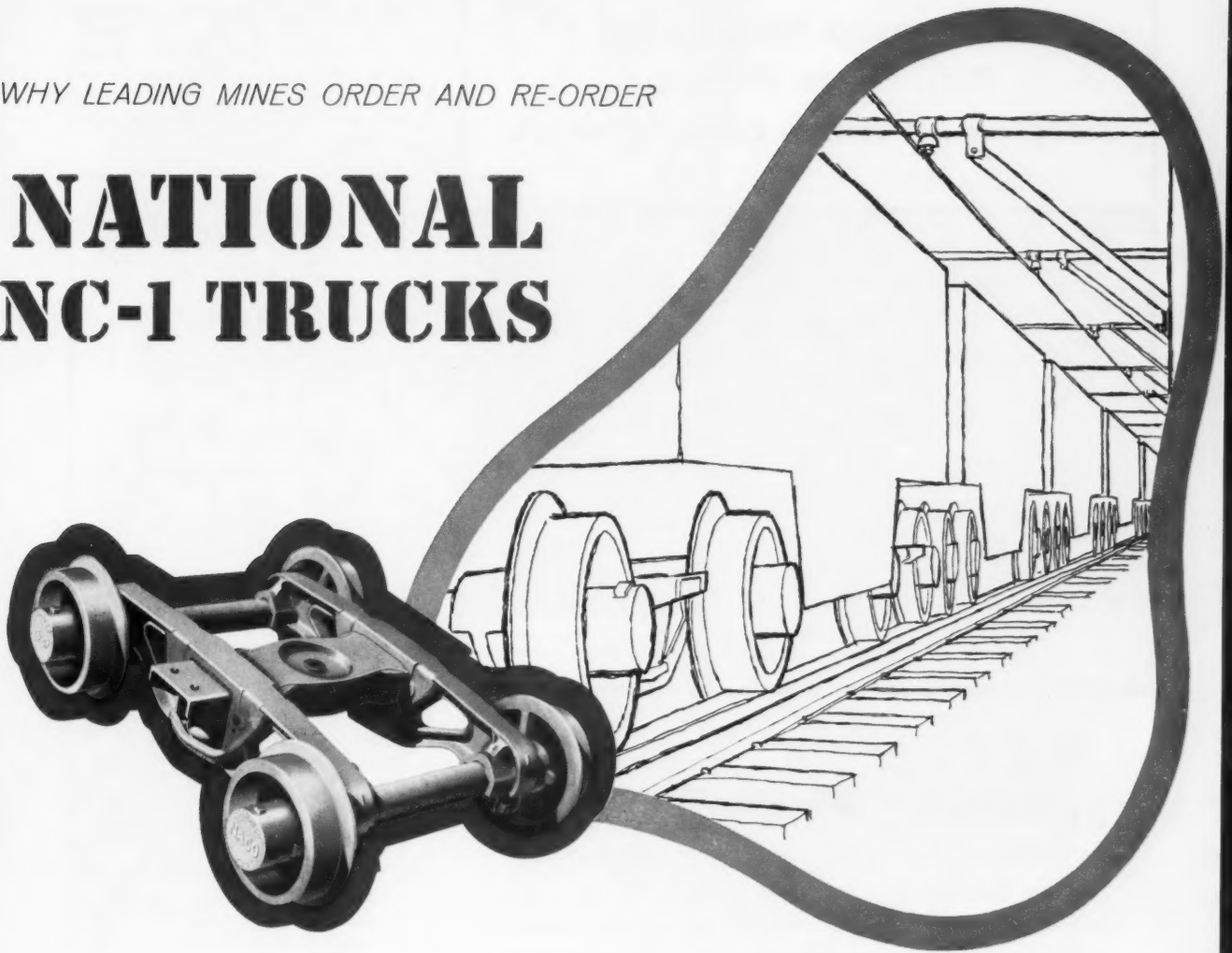
Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing Equipment • Asphalt Plants



6111

WHY LEADING MINES ORDER AND RE-ORDER

NATIONAL NC-1 TRUCKS



The reasons for the decided swing to National NC-1 Trucks are fundamentally two: they provide safety to personnel and equipment... they make money for mine operators. There are lots of technical reasons, too. Let our representatives tell you all about them.

A-1792A

Mine Sales • Transportation Products Division

WILLISON AUTOMATIC COUPLERS

•
RUBBER CUSHIONING DEVICES

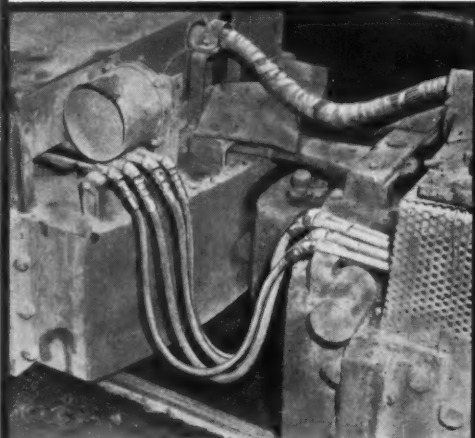
•
NACO STEEL WHEELS

•
NACO STEEL LINKS
& SWIVEL HITCHINGS

NATIONAL
MALLEABLE AND STEEL
CASTINGS
COMPANY

Cleveland 6, Ohio

Aeroquip Hose and Reusable Fittings help keep mine cars at work



Mine cars rely on hydraulic lines of Aeroquip Hose and Reusable Fittings for long on-the-job reliability.



Dependable hose line performance maintains equipment on the job.

KEY TO DETAIL INFORMATION
SEE OUR CATALOG COPY IN

COAL
INDUSTRY
PURCHASING
MANUAL

A large coal mine in West Virginia reports: "An Aeroquip installation is a lasting one. It cuts downtime and helps keep our mining equipment at work. On-the-job hose line assembly cuts out a large inventory."

In this mine Aeroquip Hose and Reusable Fittings keep a wide variety of equipment such as mine cars, hydraulic pumps, valves and motors in efficient running order at operating pressures to 1500 psi. When infrequent replacement is necessary, a length of Aeroquip Hose cut from a bulk coil and quickly assembled with Reusable Fittings is all that is needed. Fittings can be used over and over again.

Similar reports from enthusiastic users show you're in good hands when you consult with Aeroquip. Full information on the superior performance of Aeroquip Hose and Reusable Fittings is contained in Industrial Catalog No. 204. Your Aeroquip Distributor will give you a copy and discuss the broad range of fluid line applications that will be of help to you. His telephone number is in the "Yellow Pages" under "Hose."

Aeroquip

AEROQUIP CORPORATION • JACKSON, MICHIGAN
Industrial Division, Van Wert, Ohio • Western Division, Burbank, Calif.
Aeroquip (Canada) Ltd., Toronto 19, Ontario
Aeroquip products are fully protected by patents in U.S.A. and abroad.

News Roundup (Continued)

R.R., West Kentucky Coal Co. and Cyrus Eaton, chairman, West Kentucky Coal Co.

The defendants were accused of conspiring to bring in western Kentucky coal to the TVA Widow's Creek Plant near Bridgeport, Ala., to the detriment of the southeast Tennessee coal fields.

Equipment Approvals

American Mine Door Co.—Little Chief rockdust distributor; one motor, 5-hp, 440-V, AC. Approval 2F-1608A, Jan. 13.

Long-Airdox Co.—Long arm miner; three motors, one 50-hp and two 5-hp, 440-V, AC. Approval 2F-1609A, Jan. 17.

Goodman Mfg. Co.—Type 967-B loading machine with reverser for head motor; four motors, each 21-hp, 550-V, DC. Approval 2F-1610A, Jan. 27.

Jeffrey Mfg. Co.—Type MT-67 shuttle car with electrical conveyor drive; five motors, two 23-hp, one 20-hp, and two 15-hp, 440-V, AC. Approval 2F-1611A, Jan. 30.

Goodman Mfg. Co.—Type 670-20 shuttle car; three motors, two 20-hp and one 10-hp, 440-V, AC. Approval 2F-1612A, Jan. 30.

Plymouth Locomotive Works—Model JMD-24, 15- to 20-ton locomotive powered by a Caterpillar Model D326F diesel engine for use in non-coal mines. Approval 24-36, Jan. 30.

Goodman Mfg. Co.—Type 670-21 shuttle car; three motors, two 20-hp and one 10-hp, 440-V, AC. Approval 2F-1613A, Jan. 31.

Approvals 25, 26, 29, 1016, 1027, 603K and 617, which cover various cap and hand lamps, were transferred from the McGraw-Edison Co. to the Nickel Alkaline Battery Div. of Electric Storage Battery Co., Philadelphia, Pa., on Jan. 16.

Approvals 1224K, 1224P and 1229, which cover various single-shot blasting units, were transferred from the McGraw-Edison Co. to the Nickel Alkaline Battery Div. of Electric Storage Battery Co., Jan. 16.

Identification Symbol 130-BM was assigned to the Coleman Cable & Wire Co. on Jan. 12 to identify cables accepted by the Bureau as being flame resistant.



Need track bolts or spikes in a hurry?

Bethlehem stocks a full range of sizes. For rails from 12 lb per yd up—track bolts with oval necks, rolled threads, and either heavy square or hexagon nuts. Spikes for rails from 12 lb per yd, with hook heads and sharp wedge points.

For quick delivery of track bolts or spikes (and other mine fasteners) call our nearest sales office. Or write to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation



*For Strength
... Economy
... Versatility*

BETHLEHEM STEEL



New power shift transmission and increased horsepower boost stripping production 30-50%, so...

NEW D9E RETIRES BIG RUTH

IT'S A SHAME IN A WAY, even though *Big Ruth* was only a tractor. She was special, of course—a Cat D9 Tractor... and famous all over the Western Pennsylvania coal fields. She was the first D9 to be used for stripping in that area. That was back in 1956.

She worked for four years... logged 14,000 hours of service... set many a new production record... then, still in her prime, still gouging out overburden like most tractors wish they could, she was traded in by her owner, S. C. Monnie Company, Glen Campbell, Pa., for a new D9E.

Why?... because there's not a tractor going that can hold a candle to the new D9E when it comes to production. Here are some of the reasons:

PLENTY OF POWER—With a full 335 HP (up from 286) the D9E packs more lugging ability, delivered by an efficient, low-maintenance Cat Diesel Engine.

CLUTCHLESS SHIFTING—With the D9E's optional power shift transmission, you can shift *on the go*, under full load, in a split second. One lever does it. An operator can work all day long without tiring. And he can get more work done, too! As S. C. Monnie says, "It takes the *hurry* out of working fast."

HYDRAULIC TILT CYLINDER—This attachment puts more prying power on the corner of the blade; permits quick on-the-go tilting of the bulldozer, speeds removal of stumps and rocks.

Is it any wonder S. C. Monnie traded up? He's getting 30-50% more production out of the new D9E... it works for just 4 hours and keeps a loading shovel busy for *two shifts*. The rest of the time it's benching for a 2½ cu. yd. dragline and 1½ cu. yd. shovel. But even this is only part of the story of D9E superiority.

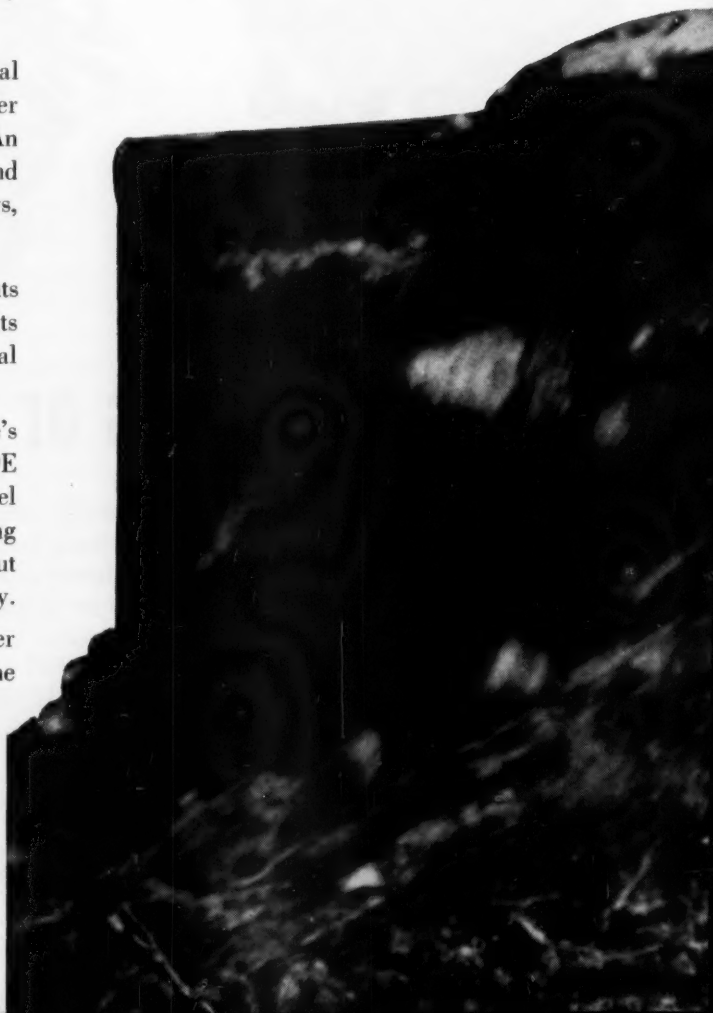
Its massive, *heavy-duty undercarriage*, with larger links, pins, rollers, shoes, improved materials and the

high ground clearance... its *lifetime lubricated rollers* that never need lubrication until rebuild time... a *rugged ripper* and other attachments that make the D9E more useful around a mine—these you have to see to fully appreciate.

AND YOUR CATERPILLAR DEALER is the man to show you. He'll demonstrate the D9E for you... and match it against any tractor you have or can buy. See him—it could mean money in the bank for you.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.



O-B Designs For Mining Men



RESULT:

A 4-way expansion unit that holds in soft shale or hard rock



4-WAY EXPANSION UNIT BUILDS HOLDING POWER FAST . . . because the flexible fingers of the shell are slightly pre-expanded to grip the wall even before wrenching begins.

GOES UP FAST AND STAYS PUT. When the bolt is shoved up the hole, the expansion unit holds the bolt in place until it's tightened . . . no need to have hands exposed to injury during wrenching.

GREATER STRENGTH IN HARD TOP . . . BETTER "PURCHASE" IN YIELDING TOP . . . because the expansion pressures are spread evenly over the four shell fingers to make the best use of the entire unit's strength. These are the reasons for the O-B Expansion Unit's popularity with mining men. It is easy to understand why more mine roof is supported with O-B Shells and Plugs than with any other kind.

For further information and prices, see your local O-B sales-engineer or write us now. OHIO BRASS COMPANY, MANSFIELD, OHIO. Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

Ohio Brass 

EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY
AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS

HOLAN

10049-M

Coming Meetings

Fourth Symposium on Rock Mechanics, Mar. 30-April 1, 1961—Pennsylvania State University, University Park, Pa.

Sixth Annual Minerals and Petroleum Conference, Southwestern Alaskan Chapter, AIME, April 7-9, 1961—Anchorage, Alaska.

Tenth Coal Industry Management Workshop, Pennsylvania State University, April 9-14, 1961—White Sulphur Springs Hotel, Mann's Choice, Bedford County, Pa. Hotel accommodations limit registration to 35.

Twelfth Annual National Conference and Convention, American Institute of Industrial Engineers, Inc., May 11-13, 1961—Sheraton Cadillac Hotel, Detroit, Mich.

1961 Coal Show, American Mining Congress, May 15-18, 1961—Cleveland, Ohio. Cleveland Hotel Reservation Bureau, 511 Terminal Tower (Telephone: MAin 1-4110).

Sixth Annual Appalachian Underground Corrosion Short Course, June 6-8, 1961—West Virginia University, Morgantown, W. Va.

Forty-Fourth Annual Meeting, National Coal Association, June 6-8, 1961—Mayflower Hotel, Washington, D. C.

Eleventh Annual Short Course in Coal Preparation June 12-July 21, 1961 — West Virginia University, Morgantown, W. Va.

Fifty-first Annual Convention, Mine Inspectors' Institute of America, June 19-21, 1961 — Penn-Sheraton Hotel, Pittsburgh, Pa.

Rocky Mountain Coal Mining Institute Meeting, June 25-28, 1961—Hotel Colorado, Glenwood Springs, Colo.

International Briquetting Association Conference, Aug. 28-30, 1961—Jackson Lake Lodge, Jackson, Wyo.

National First-Aid and Mine-Rescue Contest, Oct. 2-4, 1961—New Public Auditorium, Pittsburgh, Pa.

Coal Division Conference, American Mining Congress, Nov. 17, 1961—Penn-Sheraton Hotel, Pittsburgh, Pa. This conference culminates the work of the eight Coal Division Committee Meetings noted below:

March 7, Mechanical Mining; March 8, Safety; March 9, Roof; March 10, Research; Penn-Sheraton Hotel, Pittsburgh, Pa.

(Continued on p 62)

MANAGEMENT HAS A STAKE IN MAINTENANCE

... because it can radically affect the tons-per-man rate

Nobody needs to be told—least of all management—that the coal industry is looking for new ways to boost the tons-per-man rate. That's why forward-looking operators are beginning to take a closer look at the maintenance practices in their mines.

Maintenance today is an exact science. And the rewards of treating it as such can pay off in a drop in maintenance costs—often as much as 15 per cent.

The major pay-off, however, is in raised production rates—in other words, in more tons per man-hour.

An efficient maintenance program pays immediate dividends with virtually no capital investment.

The reasons are fairly basic: In the vast majority of mines, maintenance practices have not kept pace with the rapid mechanization of mine operations. And neglect of proper maintenance will inevitably exact a toll in excessive downtime, wasted lubricants and idle men—all factors affecting the cost of producing coal.

Chief electricians and master mechanics are doing their best to combat the problem, but they need management's support—and management realization that the problem exists.

For example: A machine that's overloaded will develop more power, dig more coal. *But* it will go to

the shop a lot faster, too—overloaded bearings will fail, seals will give way, and the machine is down.

Management men who have investigated this problem, have found that optimum production on a long-term basis can only be achieved by eliminating those practices designed to provide a short-term gain.

This means a planned maintenance program operating on a year-round basis.

TEXACO CAN HELP YOU SET UP A PLANNED MAINTENANCE PROGRAM

Lubricants are important in keeping equipment operating efficiently. Not only the choice of the lubricant itself, but also its storage, handling and application can affect equipment life. For this reason Texaco has made an exhaustive study of mine maintenance problems. We would be glad to help you set up a planned maintenance program or discuss any phase of it with you. Just call the nearest of the more than 2300 Texaco Distributing Plants or write to Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

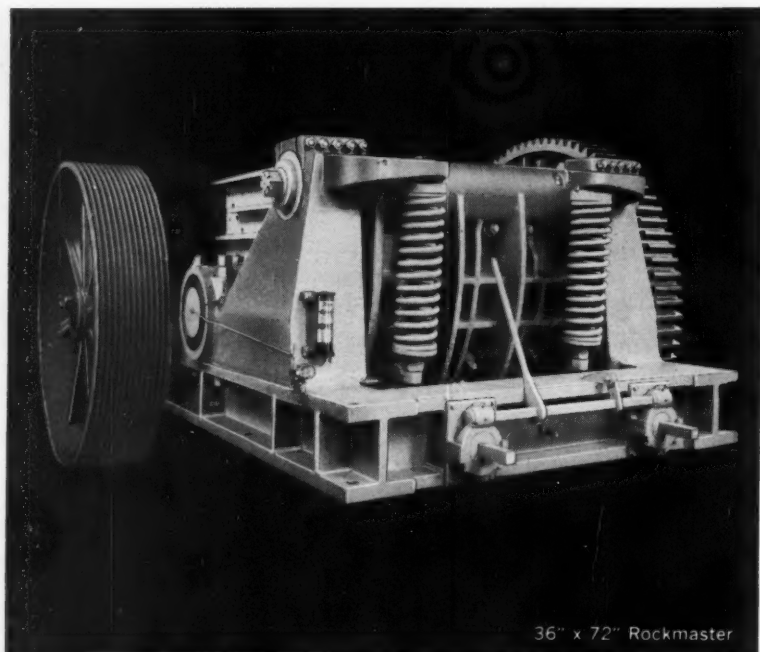
Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV



LUBRICATION IS A MAJOR FACTOR IN COST CONTROL
(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

world's **FINEST** **CRUSHERS**

for rock, slate and other mine refuse



36" x 72" Rockmaster

High in capacity and ruggedly constructed, Rockmasters have the strength for economy and long service in the coal industry's most severe crushing applications. Steelstrut Toggle automatically releases tramp iron, while the Quick-Adjustment controls size ranges. Other advantages: Extraordinary ratios of reduction, lower power and maintenance costs, excellent resale value. *Get all the facts from Bulletin RMTD-56.*



ROCKMASTERS

McLANAHAN & STONE CORPORATION
250 Wall Street • Hollidaysburg, Pennsylvania

Coming Meetings

(Continued)

March 21, Coal Preparation; March 22, Haulage; March 23, Power; Daniel Boone Hotel, Charleston, W. Va.

April 5, Strip; McCurdy Hotel, Evansville, Ind.

Aug. 9, Roof; Aug. 10, Mechanical Mining; Aug. 11, Haulage; Daniel Boone Hotel, Charleston, W. Va.

Aug. 22, Coal Preparation; Aug. 23, Power; Brown Hotel, Louisville, Ky.

Aug. 25, Strip; McCurdy Hotel, Evansville, Ind.

Aug. 31, Safety; Sept. 1, Research; Sheraton Park Hotel, Washington, D. C.

Competition

As a result of its January conference in Caracas, Venezuela, the Organization of Petroleum Exporting Countries will ask each member nation to state its position "in the matter of determination of oil prices" and will then decide on measures to adopt.

Most of the members agree that oil companies' profits are "in excess of what may be regarded as fair." Statements of member countries on prices will be referred to O.P.E.C. legal advisers and recommendations decided upon "with the object of restoring prices to levels which members consider justified."

Also, "friendly countries" with policies of restrictions and quotas will be asked to discuss these quotas in order to arrive at "satisfactory solutions." In addition, an examination will be made of the curtailment of activities in the development of the Venezuelan petroleum industry and remedies proposed.

The O.P.E.C. was founded last September in Baghdad with the object of raising oil prices and protecting the interests of its member countries—Venezuela, Kuwait, Iran, Saudi Arabia, Iraq and Qatar. With its permanent seat in Geneva, Switzerland, the organization will consist of a "conference," to be held twice yearly, and a board of governors—one governor for each member—which will meet at least four times a year.

An increase in heavy fuel oil imports of 106,000 barrels a day was recommended by the Petroleum Industry Research Foundation, Inc. for the first quarter of 1961 to avert a shortage at the end of February. The increase would mean an additional supply of 9,500,000 barrels for the first quarter.

Import allocations for the second quarter should be set at 348,000 barrels a day, or 18,000 barrels a day more than was imported in the second quarter of 1960, the trade organization noted.

LE ROI LRD-3

for powerful,
deephole rotary drilling

Here's the *big rig* . . . completely self-contained for putting down hole as large as 7 $\frac{3}{8}$ in. to 100 ft. depth!

The LRD-3 is available with either crawler or truck mounting. An enclosed cab can be furnished to provide all-weather protection for the operator while drilling. All controls are conveniently grouped for easy operation and good visibility.

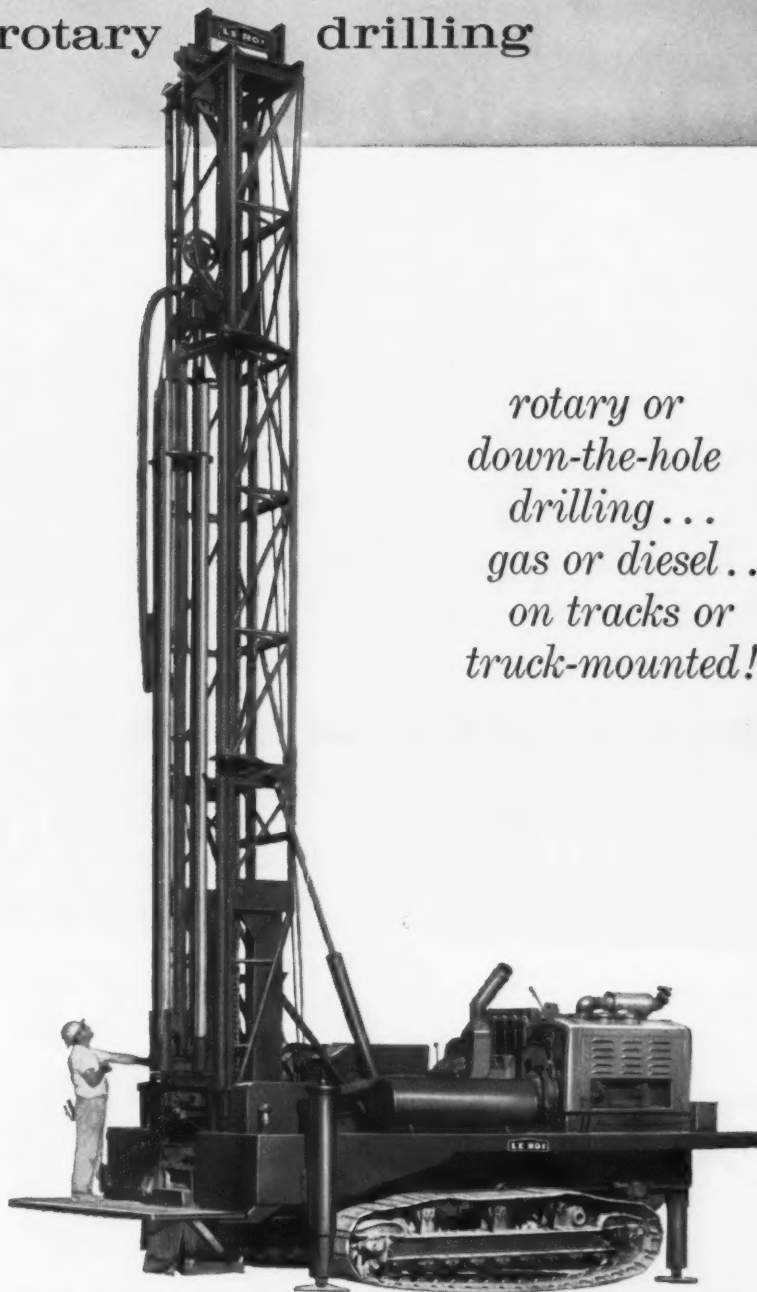
The traveling head design of the LRD-3 provides positive mechanical power without excessive torque loss under heavy pulldown, and permits easy control in making up and breaking down drill pipe. Every function of the unit is designed to speed productive drilling and keep the operator making hole. Leveling, raising the mast, and even the automatic drill pipe magazine are hydraulically controlled for speedy operation. A powerful dust collector traps cuttings and blows them well away from the unit.

An extra-sturdy 4-speed chain-hydraulic pulldown puts up to 30,000 lbs. of pressure on the bit of the LRD-3. A rugged dual-range transmission provides rotary speeds from 9 to 168 rpm in a selection of 10 forward and 2 reverse speeds.

Where needed, the rotary bit can be quickly changed for a powerful down-the-hole drill. A Le Roi 100 hp dual-manifold air compressor provides plenty of 100 psi air for punching through tough rock with the down-the-hole drill, or it can be set to deliver 625 cfm of 40 psi air for fast, efficient removal of cuttings in rotary operation.

The LRD-3 comes complete with a hydraulically operated magazine with capacity for four 20 ft. drill pipes, and can be equipped with such optional equipment as lights for night-time operation, a mounted bit grinder, air hoist, breakout tongs, water injection system, etc. Specification Sheet AT-147 describes the unit in detail, with complete spec information. Send for a copy.

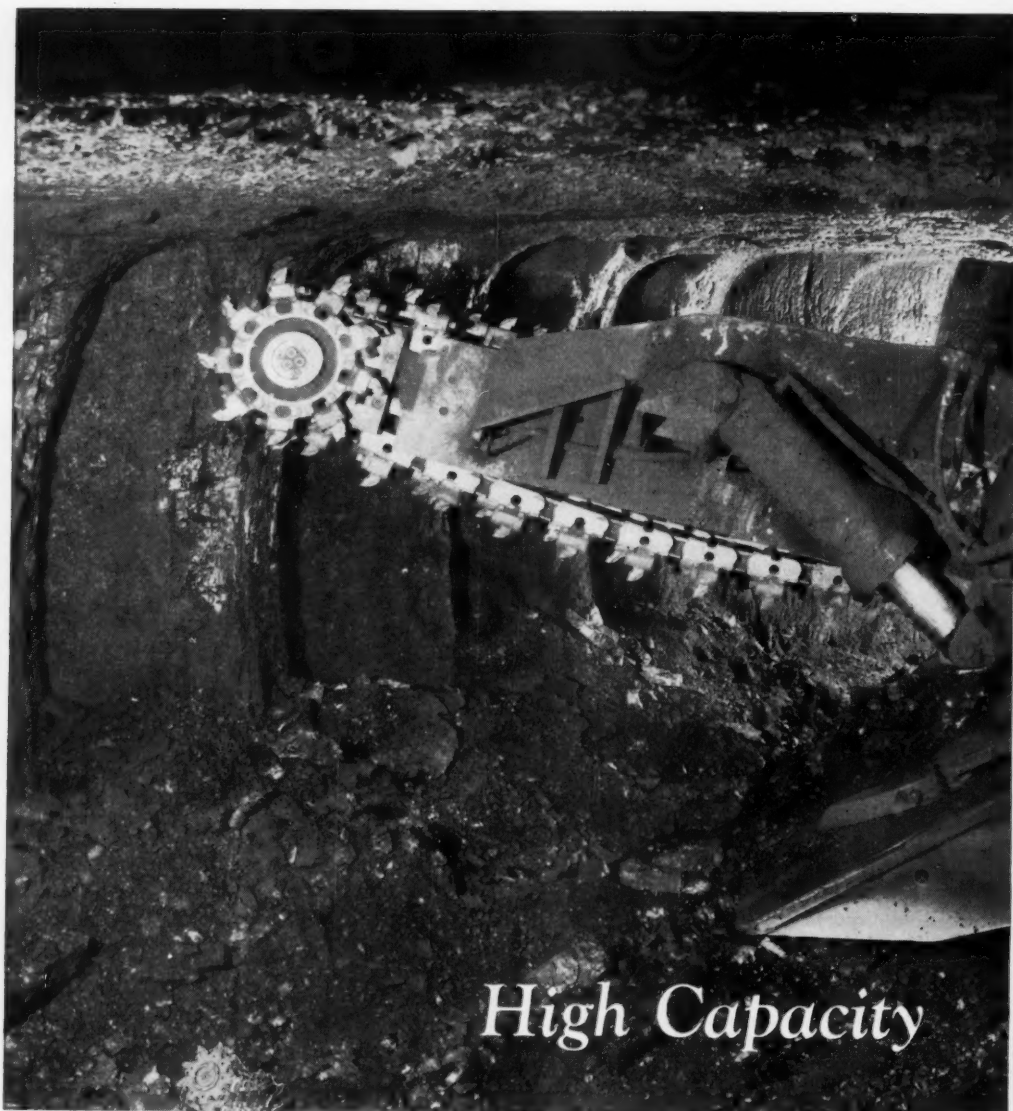
*rotary or
down-the-hole
drilling . . .
gas or diesel . . .
on tracks or
truck-mounted!*



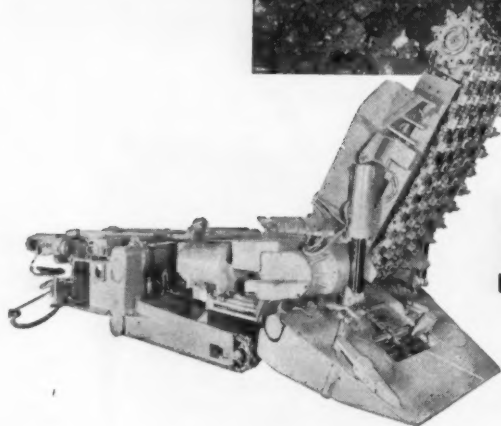
LE ROI

division of Westinghouse Air Brake Co. Sidney, Ohio

Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Alabama.



High Capacity



JOY 6-CM



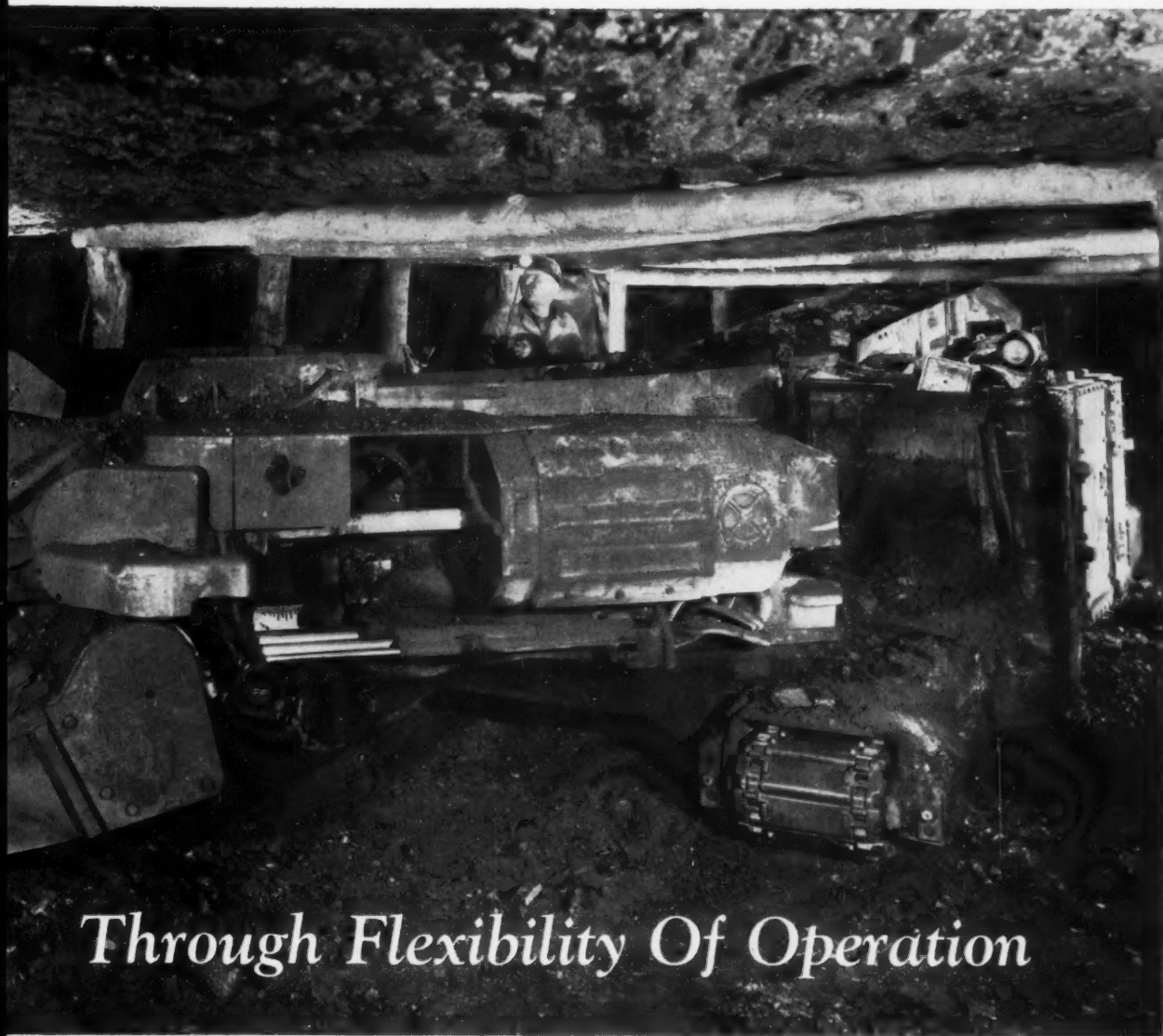
**WORLD'S LARGEST MANUFACTURER OF
UNDERGROUND MINING MACHINERY**

JOY



Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company
(Canada) Limited, Galt, Ontario



Through Flexibility Of Operation

CONTINUOUS MINER

The Joy 6-CM is the most *flexible* high tonnage miner on the market. Rated at 5 to 5½ tons per minute, the 6-CM will mine rooms 12 to 22 ft. wide without adjustment, or *repositioning the machine*. Using a standard 7 ft. ripper bar, the 6-CM can mine any seam from 5½ to 10 ft. high without changing or adjusting parts. It can cut 7 inches below the floor line. That's flexibility. The machine can be furnished with twin roof bolting drills. Because the 6-CM works from a stationary position, mining is not interrupted during bolting.

The 42-inch wide ripper bar sumps 24 inches into the coal, mining more coal with every cut. A fast, gathering arm cleanup, and the wide conveyor are each

powered independently of the ripper head . . . the 6-CM can do auxiliary cleanup while the shuttle cars are changing. The coal is stored on the conveyor for immediate unloading.

The 6-CM has two-speed tramming, 85 and 45 feet per minute. Crawler treads 16 in. wide make it sure-footed, even on grades and soft bottom.

The mining speed and flexibility makes the 6-CM a top performer in seams of 66" and higher. Rugged construction, with extra strength where experience has shown that it is needed, keeps maintenance and downtime at a minimum. Talk to your Joy engineer about it. He has complete data.

NEW! CARMET® BR and RB

Quick-Change Bits

For Faster Changes ... For Longer Life

Faster bit changes and fewer of them are yours with the new Carmet cutter bits designed for tool blocks using a Neoprene cylinder to hold bits without setscrews. Special Carmet advantages make cutting easier, tools last longer.

B style has a flat, square back gage stop to prevent tearing the block and wearing the neoprene, and a front removal notch. RB has a front gage stop and back removal notch for applications where it is easier to remove the bit from the back. The RB's two step tip design leads to easier regrinding, and lower grinding costs.

Detail features of these bits are shown at the right, and both are available with open faced, full radius carbide inserts (designated B and RB), or with the round, cylindrical plug insert (designated BR and RBR).

Why these new Carmet Cutter Bits are Better and Last Longer

- ✓ Gage stops are flat — designed to prevent battering and swedging of tool blocks.
- ✓ Gages are a full 3/4 inch and have smooth edges to eliminate splitting and mushrooming of blocks. This design also insures longer life for the Neoprene cylinder that holds the cutter bit.
- ✓ Three grades of carbide are available in Carmet cutter bits—to give you long life by matching the right carbide grade to your cutting requirements.

Quality Is In Every Carmet Cutter Bit

Carmet makes its own cemented tungsten carbide inserts. Carmet control over all phases of bit manufacture is your guarantee of top quality.

Call on your local Carmet distributor for mining tools with quality built in all the way through. He has complete stocks of the Carmet tools you need and can help you in their selection because he knows local mining conditions. And, your Carmet distributor is always glad to send out the Carmet field engineer to help you solve tool problems and cut mining costs—or even set up an entire tooling program for your particular mining operation.

Insist on the best in tools and local service. For a catalog supplement sheet on the BR and RB quick change bits, call your local Carmet distributor (see list), or write: Allegheny Ludlum Steel Corporation, Carmet Division, Ferndale, Detroit 20, Michigan. Address Dept. CA-3.

CARMET® 
CEMENTED CARBIDE • DIVISION OF ALLEGHENY LUDLUM

BR-3
Special Cutter
Bit



Front
Removal Notch
Three Carbide
Grades to select from
Maximum clearance
for easier cutting—no
heeling or drag Flat, square gage stop
Notch for Neoprene Cylindrical
wedge

B style cutting bits are the same as
above with an open-faced radius
Carmet Carbide insert.

RB-3 Special Cutter
Bit With Front
Gage Stop



Easier regrinding—
saves grinding costs
New removal notch

Flat Gage Stop prevents wear on
block and Neoprene

RBR-3 style cutting bits are the same
as above with a round cylindrical
Carmet Carbide plug-type insert.

Get more information from your local Carmet distributor:

Supplement to the Carmet Mining
Tool Catalog lists advantages and
quantity prices of the new time-
saving bits. For your copy see your
distributor, or write Carmet.

Birmingham Bolt Co., Ensley, Ala.
Bluefield Hardware, Bluefield, W. Va.
Brace-Mueller-Huntley, Inc.
Offices: Buffalo, Rochester &
Syracuse, N.Y.
Carbon Transfer, Helper, Utah
Carlsbad Supply Co.,
Carlsbad, New Mexico
Consolidated Supply Co., Picher, Okla.
C. F. Gharst Supply Co.,
Terre Haute, Ind.
Gladstein Co., McAlister, Okla.
Goodman Manufacturing Co.,
Chicago, Ill.
Marion Mine & Mill Supply Co.,
Nashville, Tenn.
McCombs Supply Co.
Offices: Harlan, Ky. & Jellico, Tenn.
Mine Equipment & Supply Co.,
Madisonville, Ky.
Oglebay Norton Mine Supply Div.,
St. Clairsville, Ohio
Peerless Supply Co.,
Des Moines, Iowa
Persinger Supply Co.,
Offices: Williamson, W. Va. &
Charleston, W. Va.
W. B. Thompson Co.,
Iron Mountain, Mich.
Tri State Mine Supply Co.,
Uniontown, Pa.
Union Supply Co., Denver, Colo.
Vanguard Supply Co., Chicago, Ill.
R. A. Young & Sons, Inc., Fort Smith, Ark.

Devoted to the Operating, Technical and Business Problems of
The Coal-Mining Industry



MARCH, 1961

IVAN A. GIVEN, EDITOR

Breakdown Reduction

Engineering breakdown resistance into mining equipment is perfectly possible. But there is a price. It may be as much as 50% to 100% more than the cost of the machine as conventionally built. The question then becomes: "Will this extra outlay pay off?" The answer, with almost no exceptions, is an unqualified "yes."

The payoff can come in one or both of at least two ways. First, with certain types of units—miners and loaders, for example—the extra operating time provided by breakdown reduction can permit at times the same production with the elimination of as much as one machine out of three and almost certainly one machine out of 5 or 6. Thus, investment is not increased and might even be reduced, and for every unit that is not needed operating labor and maintenance are eliminated. Secondly, the remaining machines require less maintenance, resulting in a second saving which could aggregate several cents per ton for every ton produced. In fact, some machines have been installed not primarily to raise unit output but to get the maintenance savings.

Coal men now are being confronted with added costs of engineered breakdown reduction. They should not dodge. Paying the added price is a sure road to lower overall costs.

New Museum Pieces?

A bell from a steam locomotive has been placed in the lobby of the Commerce Building in Washington, D. C., as a memento of a vanished age, and some have held that the coal-fired home-heating plant might join it before too many more years. If it does, perhaps it may have company—specifically the oil tank. Consider this statement in the General Electric employee publication on the creation of "Electric City, U.S.A.," near Menlo Park, N. J.: "Not a single

gas main will cross Electric City, U.S.A.' likewise, fuel-storage tanks could well become the first item in this modern community's museum."

It's a startling thought but a perfectly sound one in view of the progress being made in electric home heating and cooling. In this progress, in addition to Electric City, a 132-unit \$35-million all-electric apartment house was unveiled in Philadelphia late in 1960. All this is evidence that "coal-by-wire" is now more than ever a practical reality, and that it will build load for the utilities and business for coal.

Better Than Dole

The long process of wringing labor out of coal has always been one of the industry's handicaps public-relations-wise. Probably all of the squeezing could be said to be involuntary, since it all has been a result of the rise of competition. But still in tough times, as now, coal usually furnishes the horrible examples when the discussion turns to unemployment and depressed areas.

One can wish that there was some magic answer. No coal operator closes a mine or trims a man off simply because he doesn't like men. But somehow the public—and its legislative representatives—tend to that way of thinking. Perhaps the best approach to the reproaches—veiled or direct—is patience, willingness to explain and getting there first with the word where possible—along with a gentle reminder from time to time that if money is to be spent directly to relieve unemployment, it is better to spend it on buying coal or something that will directly and immediately affect coal production. Reopening closed mines and expanding production is the soundest of all ways of relieving mining unemployment. Even if the basis of reopening is not strictly economic and the coal is given away in distressed foreign lands or stockpiled, as examples, it would still be better than a dole,

Productivity . . . Progress and Problems

How productivity is defined

Productivity and wage increases

The records: coal and other industries

Productivity indexes in wage determinations

Edward G. Fox
President, Bituminous Coal Operators'
Association, Washington, D. C.

"PRODUCTIVITY" has been the subject of a great deal of speaking and writing in the past 10 yr. These discussions have been in general terms—not related to specific measures of results from operation of a continuous mining machine or even an individual mine, but to productivity's highly theoretical role in attaining a certain rate of national growth or to productivity gains as an offset to wage increases and in support of wage demands. At the Bituminous Coal Operators' Association it is concern with the latter which has led me to analyze the broader implications of these discussions, which seem likely to continue through the "Sixties" and decades to come.

Since we, in coal, have been and will continue to be involved, it seems appropriate that we examine the subject in some detail. Perhaps we can arrive at a better understanding of the terminology, the facts, and some of the problems involved—even though we may be unable to solve these problems. In attacking the subject, we might consider it from four standpoints:

1. Definition.
2. The relationship of productivity and wage indexes.
3. The records of coal and other industries.
4. Problems in determining wage rates by using productivity indexes.

Defining Productivity

Industrial productivity is most commonly measured in terms of an index of output per production-worker man-



Edward G. Fox

hour. (I may add that by interpretation this may refer either to man-hours "paid for" or man-hours "worked.")

In any event, this is a fallacious and misleading definition. If the building contractor succeeded in getting his bricklayers to lay 750 instead of 500 bricks per day, if the mine owner succeeded in getting his hand loaders to load 9 instead of 6 tons per day, then this definition, this measurement, would be clearly applicable. And the bricklayer or the hand loader might, with some justification, ask for a 50% pay increase. Even this would lead to problems, however, some of which will be touched upon later.

But the great productivity increases of the past 15 yr have been due, almost entirely, to capital investment and management ingenuity—not to any increased effort on the part of employees, and only slightly to increased skill requirements.

During General Electric's recent dispute with the International Union of Electrical Workers, the corporation defined productivity as "the efficiency

with which goods and services are produced—that is, the ratio of the output of goods and services to the input of resources." I subscribe to that definition as the best proposed to date. It accounts not only for manpower resources, but also capital investment and the resourcefulness of management in providing new and improved methods of production. It places in proper perspective the part that our labor resources play in production, be that production greater or less.

As an illustration of the complexity of the definition and measurement problem, please note that all sorts of factors, even if relatively minor to capital investment and labor effort, play their part. Climate, for instance. This may not play an important part in coal mining, where underground temperatures tend to be the same in both Alabama and Pennsylvania. In a textile mill, on the other hand, prevailing climate may have a definite effect on the real productivity of a mill hand in Alabama as compared with a mill hand in Maine.

Air conditioning, however, may bring the actual productivity of the Alabama mill hand up to that of his Maine co-worker. But capital investment is required to do it. Does, then, the Alabama mill's "productivity per man-hour" compare with that of the Maine mill, without some explanation of what capital expenditure—in this instance on air conditioning—was required to make it comparable?

Coming closer to home, what about the highly mechanized coal mine—the strip mine or the deep mine that both cuts and loads mechanically—that 30-in seam in central Pennsylvania where mechanization is sharply limited? The latter manages to stay competitive, strictly through management ingenuity, since little or nothing can be accomplished by new capital investment, and there is no considerable record of an actual increase in labor productivity. The operator of that mine certainly must find it hard to accept the implication that any increase of the average tons produced in the industry per man-hour worked is any measure responsible for his continuing to stay in business. His hand loaders are still loading $4\frac{1}{2}$ to $5\frac{1}{2}$ tons a day—just as they did 15 yr ago!

We can trace the flowering of this output-per-man-hour concept back to the late "Forties" and early "Fifties" when labor organizations were casting

Abstracted from a paper presented at the 74th annual meeting of the Coal Mining Institute of America.

about for a new justification for wage increases, although the concept—like so many of its kind—seems to have been born in the John R. Commons school of labor economics at the University of Wisconsin 40 or 50 yr ago.

In coming out of the depression of the early "Thirties," labor organizations rebuilt and grew with a cry for a "living wage." Average hourly earnings in the manufacturing industries had sunk to 40c in 1933. In coal, the figure was 50c. Waving dozens of pay slips showing a deficit after store, powder and rent deductions, John L. Lewis looked to Washington and received a willing President's help in getting his miners a New Deal on payday. Other labor leaders followed in his footsteps until, by Pearl Harbor Day, manufacturing employees were being paid 78c and coal miners \$1.07. The war, as wars always do, increased these figures to \$1.30 and \$1.82, respectively, by the end of 1947.

Then came the drive for various fringe benefits, including increases in the cost of our own Welfare Fund. By 1959 these other employment costs had reached 54.8c per payroll hour, according to a survey by the U.S. Chamber of Commerce. (In our industry, bituminous coal, fringe costs were up to 92c per hour by 1959.) In the meantime, as I said, wage increases, even if relatively more modest than those of the war and immediate post-war eras, were in order if the labor organizations were to justify their own existence. And the labor economists seized upon "increased productivity per man-hour worked" by their members as the justification for these. They have found no better justification through this year.

The unions already had an example of self-conversion in industry to hold up as a model. Plagued by almost as many strikes as the coal industry went through in the same period, the General Motors Corp. in 1948 signed a contract with the United Automobile Workers providing, among other things, a 3c-per-hour annual "improvement factor" to all covered employees as their reward for the company's increased productivity.

Charles Wilson, then president, was reputed to have said that this should serve as a spur to management to increase the productivity rate by an even greater amount, so that management ingenuity and capital investment could be duly rewarded. The com-

pany's annual reports have indicated that Mr. Wilson was correct. G. M.'s "productivity increases"—since raised to 2½% or a minimum of 6c—have seen the corporation through 12 yr of uninterrupted labor peace. Those of you who lived through over 20 yr of labor warfare, as compared with our last decade of production uninterrupted by strikes, are well aware of the monetary value of such a period of peace.

If the definition and method of measuring "productivity" commonly advanced by the labor unions and the economists is not a good one, you may ask whether the General Electric definition could be put to as many uses. First, let me answer that few economists are making that effort. Second, you can doubt that any measure of productivity is better than an estimate, indicating a general trend, and that comparisons between or within industries are of doubtful validity.

General Electric, with its wide range of products, doubts the merit of attempting to measure productivity even within a company. It cites the story of refrigerators as an example. Technological advancement has permitted the company to decrease refrigerator prices, despite increases in wage rates in the last dozen years. On the other hand, moderate technological advancement, plus static labor productivity, plus wage increases, have forced great increases in prices of certain "tailor-made" company products over the same period.

But, you may say, a bushel of Iowa corn is a bushel of corn; a gallon of Texas gasoline is a gallon of gasoline; a ton of West Virginia coal is a ton of coal. You might then add that whatever definition you use, whatever measure you use, you certainly can compare productivity in agriculture, oil refining, and coal mining.

It just isn't that simple. Is the corn farm a mechanized industrial operation directed by the "farmer in a business suit"? Or is it a family-type farm where the kids' after-school work hours are never counted, although those hours may be the difference between failure and survival? In oil, the "laborless" fuel, where replacement of half a dozen employees by technological improvement may cut the work force by a large percentage, should those remaining get the credit, by definition, for the resulting large percentage increase in "output per man-

hour"? Variations of this sort are as endless as the variations in work practices within and between industries. *Measurement of productivity, therefore, can never be better than an estimate, indicating a general trend, whatever the definition adopted.*

As I have stated, too few economists are making any effort to measure productivity in such a way or to account for the ratio of real output to total labor and capital input. Two exceptions which I have noted are Hiram S. Davis in his book, "Productivity Accounting," and Dr. John Kendrick in his more recent paper, "Productivity Gains." These offer a background of theory which I think should now be given much wider practical application. I know that a number of bituminous coal companies have already considered various methods of analysis bearing on this problem. I want to encourage them to continue their efforts and look forward to a greatly improved understanding of the contributions toward improvement of productivity made by increased capital investment and by management ingenuity.

The Tie to Wages

The government's overall industrial productivity index has gone hand-in-hand with the wage index over the past 45 yr. That doesn't mean, however, that the two are unseverable Siamese twins, and hence an infallible guide to future wage adjustments in either an individual industry or its component companies.

As my witness, let me call upon "Mr. Labor Statistics" himself. Dr. Ewan Clague, for many years chief of the Labor Dept.'s Bureau of Labor Statistics, read a remarkable paper on this subject about a year ago.

Dr. Clague's charts showed that the rise in real hourly earnings from 1914 to 1939, and again from 1947 to 1958, rarely deviated for long from the increase in productivity per man-hour worked in the manufacturing industries as whole. Dr. Clague was indeed cautious, however, in discussing cause and effect. He admitted the many deficiencies in the definitions used. And the average annual increase of from 3 to 3.5% in the productivity of private industry was just that—an average that could be meaningless either from year to year, from industry to industry, or from company to company.

Take out agriculture with its spectacular average annual productivity increase of 6.2% in recent years, for instance, and the rest of industry's rate drops to about 2.5%. Or consider the annual fluctuations. The gain in 1950 over 1949 was about 6%. Likewise in 1955. But some recent years have shown losses, and others only very minor gains.

"This economic truism concerning [the relationship between] productivity and real wages does not readily lend itself to statistical measurement, nor does it provide precise policy guidance," Dr. Clague concluded. "Consider how remote from each other are (a) measures of output of individual workers and crews, and (b) a comprehensive measure of trends in output per man-hour for the economy as a whole. It is difficult to connect two such remote ideas in any meaningful way."

Reasons behind Dr. Clague's conclusion are many, indeed. Let me cite just a few.

Productivity as a measure for wage escalation was all but unknown at the bargaining table until this last decade. Keeping wages in line with consumer prices through escalator clauses, preserving the relative positions of various wage structures, fringe benefits that add to the wage bill, and increases obtained by strong unions for no good economic reason whatsoever have been far more prominent in modern labor history. Even the theorists, when confronted with the practical problem, have not suggested that agricultural wages over the past 10 yrs should have been more than doubled, on the basis of productivity, while wages in the industry with little or no productivity increase should have remained static.

The tendency of workers in the same craft to seek a common wage rate, no matter where employed, is another strong factor in weakening the productivity standard. A bricklayer is a bricklayer, whether employed in an automobile plant or by a Detroit building contractor. And, with certain reservations, he wants the same wages. The fact that the automobile industry's productivity has gone up while the contractor's has stood still makes little difference to the bricklayer in his thoughts or actions in wage matters.

Even those economists who have indicated that wages and productivity

should go hand in hand under every circumstance fail to realize the difficulties of measurement.

Again, for example, what of the industry which has a major shift in its working force, from unskilled to skilled, or from wage earners to white collar workers? Perhaps the shift results in (or results from) productivity increase. Or perhaps not. On the other hand, the labor rate reported may go up while unit labor cost is going down. Reporting today on such matters is far from standardized, even though the government is attempting to bring some order out of current chaos. But even when far better figures are available, I am firmly of the opinion that *supply and demand rather than a productivity index will continue to govern wage rates above such statutory minimums as the government may prescribe.*

One has only to return to the "stabilization" efforts of the government during World War II and Korea to justify this statement. Automatic federal approvals of various formulas, including cost of living and productivity escalators, were successful only to the extent that they covered those increases which a short labor supply demanded in a seller's market. When they failed to do this, labor went on strike, stabilizers resigned—and the White House had to cook up some new and face-saving excuse for granting labor demands.

Coal and Other Industries

Coal, as an industry, has had a good post-war productivity record, but other industries have also made very substantial gains.

Whatever definition of productivity we use, and however we measure it, this statement cannot be challenged.

As to bituminous coal, there was no other answer to survival.

Mechanization was the only answer. Not only the continuous miner below ground but the giant stripper above. This meant huge capital investment. But it also called for far more attention to invention, to methods engineering, to research and development, and to just plain management ingenuity than the industry had ever developed before.

It also called for a labor union that would recognize its own survival was dependent upon a cooperative effort to keep the industry alive.

Well, we did get the investment, we did get the invention, we did improve our methods as well as our machines, we did get cooperation from the union. And so today we are alive, with a well-established and improving position in the fuel market. But we must continue to improve our productivity record to keep this position even though, in my opinion, all of the "easy" gains have already been made.

Mechanization of underground mining and an increase of production by strip and auger methods have now brought the industry's overall average output per man-day up to about twice the level reached by hand loading.

We are selling our product today for a lower price per ton (fob mines) than we received 10 yr ago—and I have heard of no immediate prospect for substantial improvement along that line. And yet we are paying our miners a base rate of \$24.25 per day compared with \$14.05 in the first 2 mo and \$14.75 in the last 10 mo of 1950. Vacation payments have risen to \$200, compared to \$100 in 1950. In addition, we are now contributing a royalty of 40c a ton to the Welfare Fund to provide pensions, medical and other benefits far greater than the average prevailing in American industry.

No such sensational gains have been won by farm labor, although man-hour productivity in agriculture has more than doubled since 1947, while ours, by the same definition, has risen from a base of 100.0 in 1947 to 195.6 in 1959.

Likewise, the synthetic-fiber branch of the textile industry reports an increase from 100.0 to 274.6 in its productivity record over the same period, while other branches are not far behind. Tobacco products are only a few points behind coal, by these same Labor Dept. index surveys. And many others—steel, railroads, cement, food canning—report marked increases which place them in the same league with coal, although again the standards for measurement may vary more than the Labor Dept. would care to admit.

Certainly in all of these instances, capital investment played more of a part in increasing productivity than did any increased effort on the part of an employee or group of employees. Better equipment, improved communications, mechanization of shop and maintenance work, use of office

and accounting machinery for their mountainous paper work—these, as everyone knows, have accounted for all of the 228% increase in railroad productivity over the last 40 yr.

In fact, the railroad unions as a group are generally reputed to have fought these improvements every step of the way, insisting that the railroads retain unnecessary employees under featherbedding work rules. But these same unions then turn the industry's increased productivity around to suit their own purposes when they insist upon periodic wage increases for both necessary and unnecessary employees, to keep up with the general industrial pattern. It just can't work.

Wage-Adjustment Problems

Even if we grant, as we must, that productivity has been a factor in the determination of wage rates, the use of a productivity index in adjusting those rates can create new problems as well as solve old ones.

1. As Dr. Clague said, when you get down to cases, it is difficult to connect in any meaningful way the relationship between a national productivity index and the pay scale of an individual workman. The same holds as true for an entire industry as for the individual workman. Take the hand loader in the small truck mine and the operator of a huge shovel in a modern stripping operation. Ordinarily, the hand loader has increased his individual productivity only slightly over the years. Thanks to invention and capital investment, the shovel operator has increased his many, many times over. His job also has been upgraded considerably in skill required.

However, to say that the hand loader should never get an increase until his productivity goes up would be as impractical as to say that the shovel operator was entitled to all the wages of all the men he might have replaced had the strip coal been mined underground. No, the long-range inflationary trend and comparative skills, the return to investors, the reward of management for its skills—these and many other factors must play their part in wage determination as well as productivity gains *per se*.

2. Although we in the coal industry, by the very bulk weight of our product, have no direct competition from abroad, we face serious competition from other fuels. Modernization and technological advancement

in practically all foreign countries has been going on at a pace equal or faster than our own, and with it, productivity. For instance, Japanese textile mills required 20 man-days of work in 1947 to convert a bale of cotton into yarn. This had been reduced to 8.6 man-days by 1956, and the trend continues. Those in Pittsburgh all have heard that the ultramodern Belgian, German and French steel mills have all but captured the markets for a number of important steel products in this country. These foreign mills are using their increased productivity and basic wage rates far below ours to capture markets and insure employment, while labor in this country often insists that the worker and the worker alone is entitled to all or nearly all the productivity gains.

3. Down through industrial history, from the invention of the first machine, productivity increases have raised the spectre of unemployment and economic insecurity. This has led to that blight on economic and social progress—featherbedding. Fortunately the coal industry has had little serious demand for the employment of unnecessary labor.

I mentioned previously the railroads which for 50 yr have been plagued by labor requirements for unnecessary hours of work—or payola for hours not worked. An arbitrator told me recently of a case involving a large passenger terminal during the brief general railroad strike of 1946. The ticket-sellers, who had no call for tickets during the strike, were put to answering the many telephone requests for information. But the unemployed "extra" information clerks, belonging to the same union as the ticket sellers, filed claims for pay for each day that a ticket clerk answered the phone. Productivity be hanged! And yet those same employees undoubtedly would want to share in any increased productivity obtained by management ingenuity or capital investment.

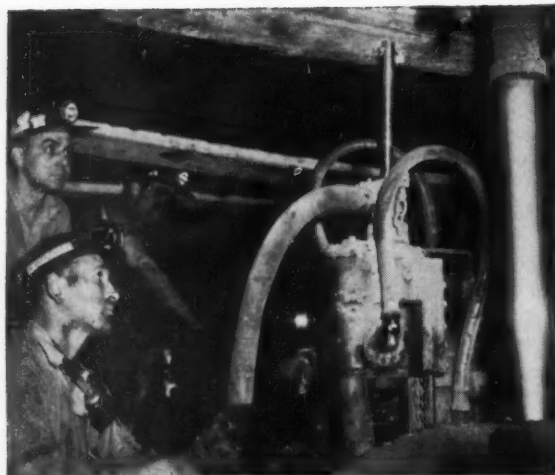
In the wide range of industry experience which is to be found between that of the railroads and our own industry are all shades of featherbedding, in one form or another. Its total elimination will probably follow by one day the total elimination of sin, since human individual reactions are involved in each.

Believe me, no one regrets more than I do that there are pockets of unemployed miners throughout the

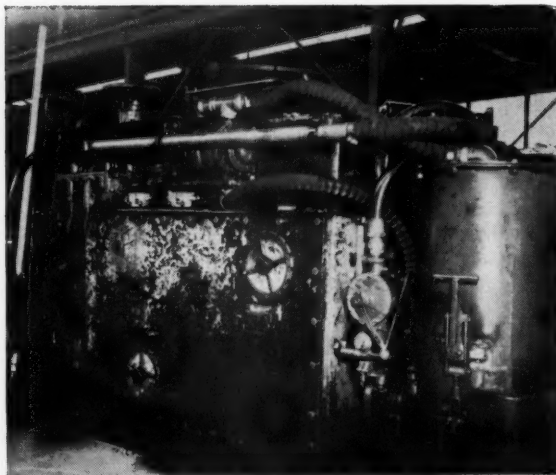
coal fields. But in a growing economy there is opportunity to find new fields of employment. Many, in fact, may be back in the mines before too long, if the optimistic forecasts of our economists come true. But industrial progress—and the basing of wages on that progress—has often required individual adjustments which are not easy to make. Full-crew laws or featherbedding, in any of its forms, could at worst bankrupt our industry in short order. At best they could stifle progress to the point that competition with the "laborless fuels" would be impossible.

4. Sooner or later, when faced with an economic problem, some group carries it to the government for solution. This problem of dividing the fruits of economic productivity has been no exception. It has been discussed and rediscussed by government economists. Most of these have agreed that government should keep hands off, other than to provide unemployment benefits and job retraining for workers displaced in the course of technological advancement. Following a Supreme Court decision requiring a railroad to bargain with a union on job abolition, however, a bill was introduced in Congress last year to reverse the court's decision. The bill died in committee. Although its purpose was good, we might well wonder about the wisdom of drawing Congress into this problem. Instead of a bill with a good purpose, we might get one just the reverse. As we have seen today, the concept that labor and labor alone is entitled to the fruits of the machine seems to be dying hard. We certainly don't want to see it revived for political purposes.

Increased productive efficiency, through increased productivity, has made America the strong nation she is today. We must keep that leadership. Bituminous coal is no exception! Accounting which provides a sound basis for appraisal of contributions made by capital investment and by management ingenuity to improvement of productivity is essential. Continuation of the union's realistic attitude toward modernization is of great importance. Above all, the bituminous coal industry must take every possible advantage of new techniques and those found successful by other industries producing or handling bulk materials in this revolutionary, electronic age.



EFFECTIVENESS of collector system is shown by the absence of dust during the drilling cycle.



NEW COMPACT HOLLOW-STEEL DUST-COLLECTOR SYSTEM on continuous miners permits full-cycle roof bolting.

In-Company Research Ups Safety,

Comprehensive research at Ireland mine, Hanna Coal Co., results in six practical developments contributing to maximum safety and efficiency.

OPERATING RESEARCH, though it costs money, is paying off for the Ireland mine of the Hanna Coal Co., Moundsville, W. Va., in the form of improved safety for employees and a healthy economic climate for the company's future. The aim is to generate worthwhile advances by the mine staff itself and also take prompt advantage of new equipment and products offered by manufacturers. In line with approach, Ireland was a major participant in the final design of the Thru-Steel Dust-Collection system of the Mine Safety Appliances Co., and was one of the first to adopt the Foam-Plug fire fighting equipment offered by Foamex, Inc. Other developments include a more effective water-spray system for continuous miners, an inexpensive foolproof rail-haulage signal device, an automatic trolley cutout switch, and improved mine-car holders and wheel chocks.

Ireland mine is approximately 25 mi south of Wheeling, W. Va. Operations are in the 5-ft-thick Pittsburgh No. 8 seam. Top consists of 0 to 4 ft of drawslate with 12 to 16 in of roof coal above it. A conglomerate shale above the roof coal is 8 to 10

ft thick with approximately 20 ft of limestone above the shale.

Ripper-type 5CM Joy continuous miners are on the production line and are backed up by conventional loaders, shuttle cars, and section ropeframe belt conveyors. Mainline haulage consists of mine cars and locomotives.

Dust Control at the Face

Two major developments have contributed to minimizing dust circulating in the face areas. Both centered on the continuous miners. One has eliminated dust produced by miner-mounted roof-bolters. Each miner is equipped with two bolting units, one on each side.

Another breakthrough in controlling dust has been use of a different type of water-spray nozzle. This, plus relocating the nozzles, has improved their effectiveness in allaying dust caused by the ripping action of the machines.

Roof-Bolt Dust-Collector System- "The Thru-Steel dust-collector system has proved effective and efficient," observes John Zitko, superintendent. Personnel at Ireland con-

tributed much of their time and experience to the final development of a better way to collect dust. This particular project was in the development stage for many months and had actually come to a standstill because the penetration rate of the bit could not be improved to the point where the bolting cycle was equal to or better than the rate of advance of the continuous-miner cycle. Continuous miners at Ireland make a cut in a 14-ft-wide entry in approximately 3 min. This means that a roof-bolter must do the job in 3 min or less.

The difficulty was that the cuttings could not be removed fast enough. Excessive cuttings remaining in the hole would bind the auger and reduce the penetration rate. A breakthrough in auger design did not occur until John Zitko hit on the idea that provision must be made to store cuttings near the cutter bit and suction port of the drill steel during periods of fast penetration.

Several different auger designs were made and tested. The one that proved most successful (see illustration) is made of 1-inch-diameter drill steel with a $\frac{5}{8}$ -in.-diameter hole and a wall thickness of $\frac{3}{16}$ in. A 3-in. reservoir, made by welding a pipe sleeve to the drill steel, provides sufficient storage space for cuttings during fast penetration. The suction port is located $\frac{5}{8}$ in from the

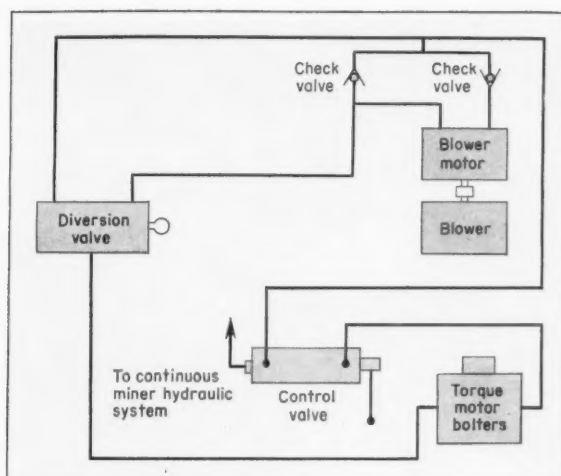
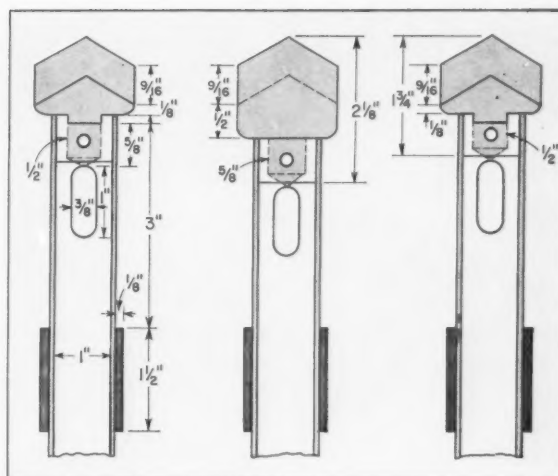


DIAGRAM shows how miner hydraulic system is used to power and control the dust collector.



HOLLOW-STEEL auger contains dust reservoir and suction port (left). Improved short bit (right) cuts drilling time.

Efficiency

auger end and is $\frac{3}{8} \times 1$ in in size. Bits used with this auger have a $\frac{1}{2}$ -in square shank.

Changes also were made in the type of drill bits. Originally, bits with a $\frac{5}{8}$ -in shank were used. These bits were longer and increased the distance that cuttings had to fall before they reached the suction port. The newer bits reduced the distance from $2\frac{1}{2}$ in to $1\frac{1}{4}$ in.

These changes have provided the following advantages:

1. Faster Penetration—Bolting cycle is shorter than the continuous-miner cycle. The reservoir for cut-

tings has reduced auger binding. Bit-design changes alone shortened penetration time 30 sec per 6-ft hole.

2. Longer Bit Life—Less heat is created at the bit-tip area. Bit design and the reservoir permits quick removal of cuttings at the cutting edges of the bits to reduce dulling.

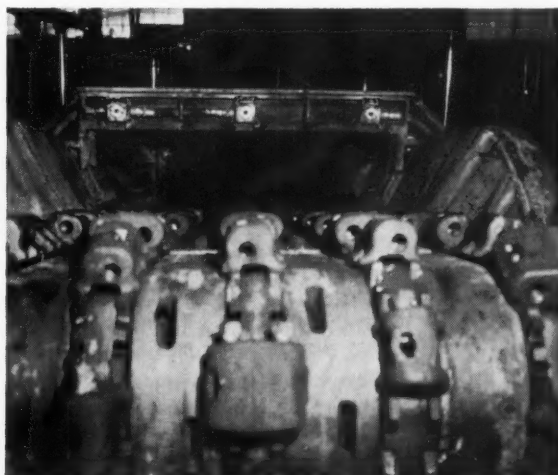
3. Lower Manufacturing and Maintenance Costs—Bits with a $\frac{1}{2}$ -in shank are standard in the industry and, therefore, are cheaper. The drill steel now used is less expensive and the manufacturing process simplified. Maintenance and replacement of augers due to breakage, bending, etc., has been reduced to a minimum.

Components of the dust-collector

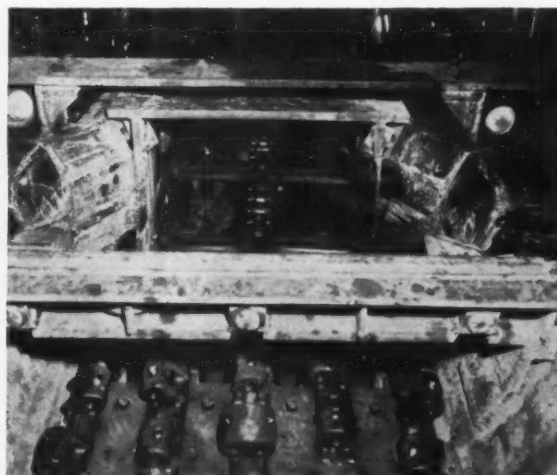
system also include a Roots-Connorsville blower; hydraulic blower motor; dust-collector head and check adapter; filter and filter tank; suction hose; and hydraulic control, diversion and check valves.

Due to the small amount of space available on the miner for mounting additional equipment, the dust-collector is powered by the miner's hydraulic system (see hydraulic diagram for details) and eliminates using an electric motor.

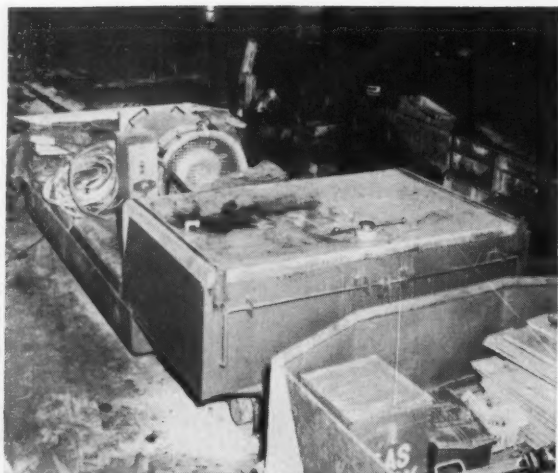
Although it is too early to fully measure the benefits of the dust-collector system, management feels that it has accomplished its initial goals. It also feels that certain long-term benefits, not yet visible, will become evident in the future. Immediate



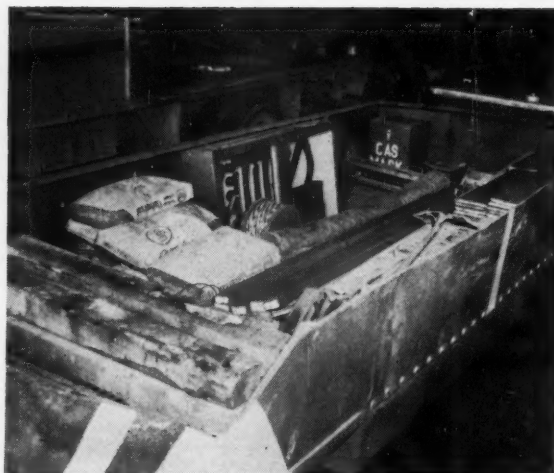
REDUCTION of dust caused by the miner is a result of re-positioning sprays and using a different type of nozzle.



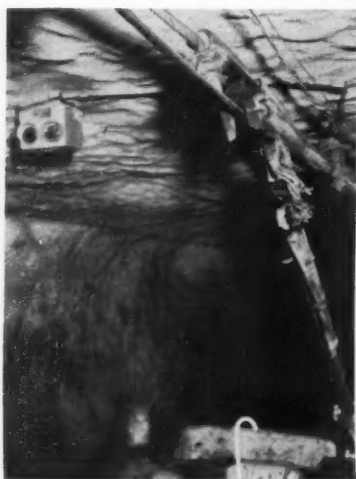
TWO FAN-SHAPED SPRAYS are mounted at the miner hopper and rear conveyor to keep dust from being suspended in air.



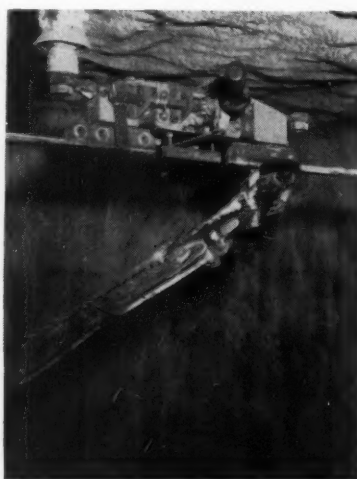
FOAM-PLUG FIRE-FIGHTING EQUIPMENT is mounted on a special car equipped with water tank.



STANDARD FIRE-FIGHTING EQUIPMENT and the foam-plug unit are placed at a strategic location in the mine.



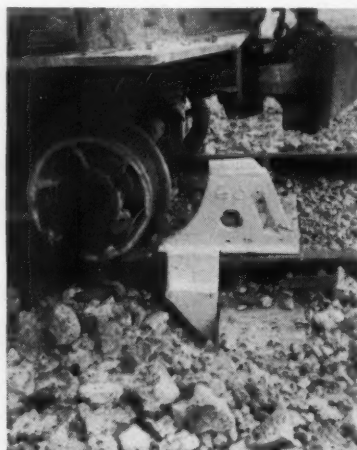
SIMPLE INEXPENSIVE SIGNAL SWITCH was designed at the Ireland mine. It requires no maintenance.



AUTOMATIC TROLLEY CUTOUT SWITCH eliminates the human element of forgetting to cut power off the section.



PERMANENT CARHOLDS can be operated to raise or lower a center stop located in the middle of the track.



PORTABLE CAR CHOCKS provide a foolproof means for holding uncoupled cars on side tracks or mainlines.

benefits of the dust collector are:

1. Elimination of roof-bolt dust in the working areas.
2. Improvement of the roof-bolting and dust-collecting cycle to permit uninterrupted continuous-miner operation.
3. Increased health and safety for workers.
4. Greater accuracy in operating the miner due to improved visibility.
5. Lower auger and bit costs.

These results have prompted management to install the dust-collector system on all miners. Miners are being equipped at a rate of one per month. It is estimated that the savings in drill steel and bits alone will pay for the system in a relatively short time.

Water-Spray System—The continuous miner water-spray system has undergone three major changes (1) different-type spray nozzle, (2) repositioning of sprays and (3) adding more sprays.

The type of nozzle that had been used to alloy dust contained a small round hole. This hole formed a large circle of spray water directed at the cutter head. A large part of the spray water could not be aimed toward the areas where the dust was originating and, therefore, much of the water was ineffective. Only a small percentage of the water pumped to the face area was being utilized, making the overall spray system inefficient. To improve the efficiency, the management contacted a representative of Spraying Systems Co., Bellwood, Ill. Recommendations were made not

only to change the type of nozzle but also to reposition and add more sprays.

The type of nozzle now being used throws out a jet spray shaped like a fan which can be directed toward areas where dust is originating. The main purpose is to trap the dust before it is suspended in air.

The next recommendation, which is equally important, was to reposition the spray nozzles. This was accomplished by welding a heavy bar across the width of the ripper chains on the miner and approximately 5 ft from the end of the ripper. Three spray nozzles are mounted on this bar so that the fan-shaped spray can be pointed directly at the point of contact of the cutter head. Incidentally, the bar has proven to be effective in breaking up large lumps of coal or rock before they go onto the rear conveyor.

Another critical area where dust is suspended in air is at the hopper between the cutter head and the rear conveyor. Two nozzles, one on each side, are mounted so that the sprays completely cover the hopper, eliminating most of the dust generated at this point.

Although the continuous-miner spray system is not 100% effective in allaying dust, it is much more effective than the original system.

Elimination of dust produced by roof-bolting and a reduction in the amount of dust caused by the ripper action of the miner have greatly improved conditions at the face from a safety and efficiency standpoint.

Fire-Fighting Equipment

Behind every research and development project is the hope that it will replace less effective methods of doing things or at least augment present methods. The development of the foam-plug method of fighting fires underground by Foamex, Inc., afforded such possibility. The Ireland mine has included this method as standard equipment for fighting underground fires. It, however, will not replace present procedures, only augment them.

Foam-plug equipment is kept at strategic locations with regular fire-fighting apparatuses.

All foam-plug equipment is contained in a special car for rapid transportation. Men at Ireland have been

trained to use the equipment properly and effectively. Fire drills, scheduled and unscheduled, are held frequently to make sure that each man knows his assigned job. After each drill, reports are submitted to determine whether it was successful or not. Recommendations are made if reports indicate that greater skill and speed can be attained.

The industry has devoted considerable time and expense on research in an effort to combat underground mine fires. The foam-plug method is one result. Management of the Ireland mine was one of the first to experiment with, contribute substantially to its development, and accept it for use. Hanna at present is one of the few mines in the industry experienced in the use of this equipment. By pressing forward in its desire to improve, Hanna management has added another tool to its increasing list of safety devices to protect men and property.

Haulage Safety Devices

Final development of four haulage projects has provided greater safety in heavy haulage at the Ireland mine. Two are in the signal and electrical phase and two in the mechanical end. Development costs were small compared to the benefits they provide.

Trolley Signal Switch—Safety as well as the cost of the haulage-signal system were considered in this project. Cost was first.

Switches used to control the red and green traffic lights underground were expensive and required a certain amount of maintenance to keep them operating. The newer unit is inexpensive and requires no maintenance. It is mounted on the top side of the trolley wire and extends down past the wire on each side to permit the trolley-pole slide to contact it as it passes. When the slide makes contact it provides power to a relay which changes the light to either red or green.

The switch consists of a door hinge tailored to fit over the trolley. The complete assembly is mounted on an insulating board which is attached to a trolley-wire hanger.

A wire spring is mounted on each side of the hinge to make sure that electrical contact is made for a long enough period to permit the relay to work. If locomotives are traveling at

high speed the slide will not maintain contact for a sufficient length of time without the wire springs.

The signal switch is as foolproof as the original switch. It is much cheaper and it does not require any maintenance.

Automatic Trolley Cutout Switch—Except for haulage, the Ireland mine is an all-AC operation. Track and trolley wire are advanced with the section operation to transport men and supplies to the face. Coal is conveyed by belt conveyor to the main entries for loading into mine cars. The only time that DC power is required in the panel entries is when men and supplies are being transported to the face.

Manual trolley cutout switches are installed at the mouths of all panel headings. Motormen are instructed to pull the switches as they leave the headings. This rule was followed but the human element remained. To eliminate it, an automatic trolley switch was designed (see photo). As the motor leaves the section the trolley slide trips the switch as it passes. Motormen do not have to remember to pull the switch; the slide thinks for them.

The switch is foolproof and it eliminates the human element, assuring all concerned that DC power is off on all panel entries unless, of course, a locomotive is present.

Permanent Car-Hold—This device is used at locations where it is necessary to store or leave mine cars. It is mounted on the under side of the track and operates somewhat like a switch-throw. The throw raises or lowers a bumper-like stop located in the center of the track to hold or let cars pass. It eliminates the unsafe "deadman" type of car holds. With it, empties or loads cannot be bumped loose, causing runaways.

Portable Car-Chocks—When it is necessary to hold empties or loads in places other than permanent locations a portable car-chock is used. These chocks are designed to fit the curvature of the car wheel and to rest on the track (see photo). Metal plates extending down past the ball of the rail on each side and past the wood ties are welded to the top track and wheel section. This part butts against the wood tie to keep the chock and car from moving, thus eliminating the possibility of runaways.

Save on construction costs with the new '61 FORD TRUCKS

FORD HEAVIES SAVE WITH DOUBLE THE CAB, SHEET METAL AND RADIATOR LIFE

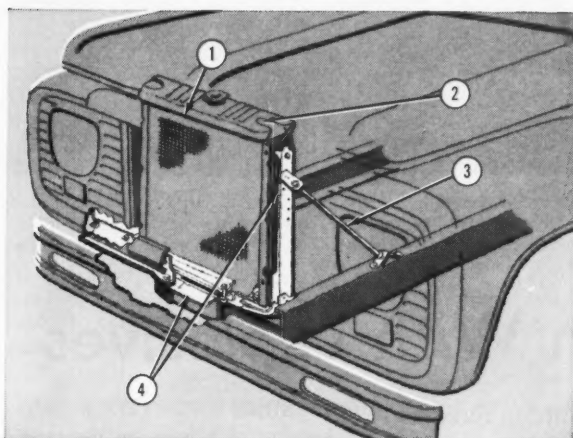
Ford F-Series Heavy Duty models are especially designed for the rugged terrain and tough conditions generally found on construction jobs. Their new independent mounting system for cab and radiator effectively separates both from adjacent sheet metal assemblies for much greater durability. And radius rod-leaf type rear springs provide better axle alignment, a smoother ride and longer spring life.

The electrical wiring system has been improved for greater reliability. Chassis wiring is fastened within the protection of the frame web, away from mud, ice and snow. And Ford Truck frames have been engineered to make the mounting of bodies and special equipment easier. A new 212-inch wheelbase model is available to accommodate extra-long bodies.

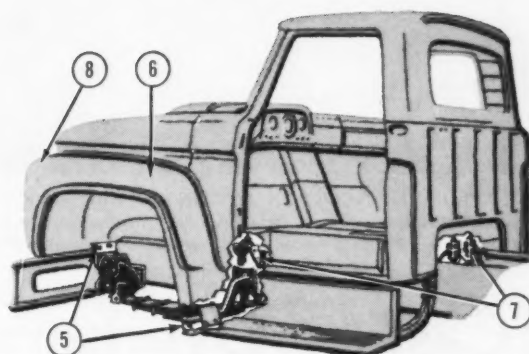
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Ask your Ford Dealer about Ford's full tandem line . . . including Super Duties with 38,000-lb. bogies for up to 51,000-lb. GVW!

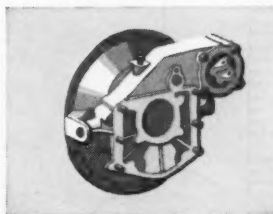




- ① **Save with Ford's exclusive "lock-seam" radiator construction** that doubles the solder area at key seams for greatly increased strength and longer radiator life.
- ② **Save with heavier-gauge metal on radiator tank and header.** Tanks and header have thicker walls to resist vibration, jolts and corrosion for greater reliability.
- ③ **Save with independent radiator mountings,** separate from front-end sheet metal. This means that road shocks and shakes are not transmitted to the radiator through sheet metal . . . tanks, tubes and connections last longer, require less maintenance.
- ④ **Save with "horse collar" mounting** for extended radiator life. This new mounting on resilient rubber at the center of frame cross member soaks up any frame flexing . . . cuts wear and tear on entire cooling system.
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- ⑥ **Save with removable fenders.** The quick and easy removal of only 8 bolts per fender provides faster service accessibility to the engine area, saving valuable maintenance time.
- ⑦ **Save with new 3-point cab mounting system** for greater cab durability. Two outboard front mounts plus a centered "twin" rear mount provide a triangular system that holds the cab stationary while allowing the frame to move independently . . . reducing strain on the cab.
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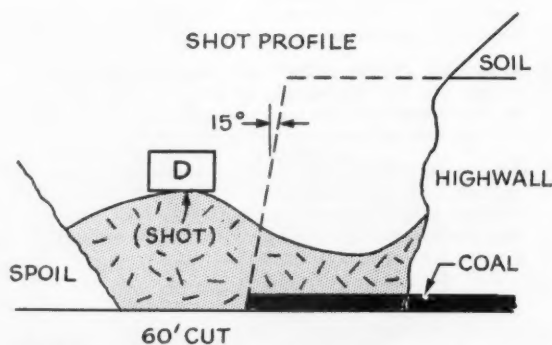
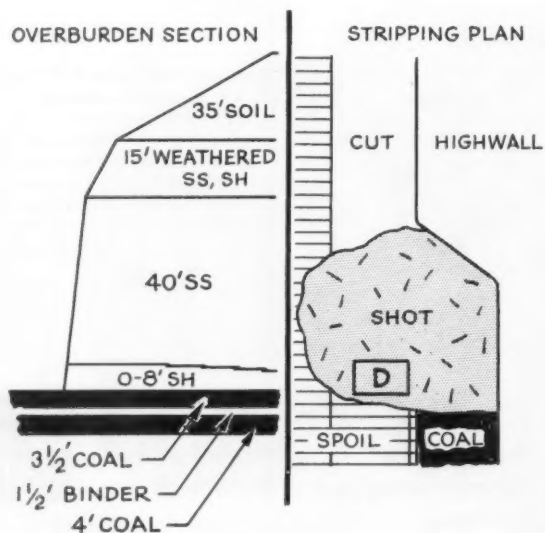


EXPLOSIVE ENERGY IN ACTION—Heavily-loaded holes take over for equipment and cast a large part of the overburden directly to spoil without handling. This development is made possible by low-cost explosives such as ammonium nitrate, which competes with mechanical energy as an economical way to move overburden, not just break it up for shovels and draglines.

Casting Overburden With Explosives

Using the energy in explosives to cast overburden receives more attention as alert operators seek ways to hold the line on costs. Here's up-to-date information on a technique designed to help primary stripping units uncover more coal.

STRIP MINE OPERATORS today are keeping close tabs on the progress of a new, highly unorthodox, approach to moving overburden—casting to spoil with explosives energy! Only a few mines are now using the latest method which uses more than 1 lb of explosive per cu yd of overburden. These report,



PLAN AND PROFILE of a typical application of explosives to overburden casting shows a minimum of material to be handled by excavating machines. Section at left shows types of overburden.



LOW-COST fertilizer-grade ammonium nitrate makes the use of explosives casting economically feasible. Here, 50,000 lb of AN pellets are prepared for loading in vertical blastholes. Inexpensive AN slurries are also considered a good possibility.

however, that using explosives energy to move overburden cuts the load on primary stripping machines and actually increases their total stripping capacity considerably. In other words, they uncover more coal in a given time without adding more equipment.

This new development first gained recognition at several small bituminous properties in western Pennsylvania. So far, little use has been made elsewhere. One reason for this

is that many mine operators are skeptical of the benefits it claims and are reluctant to experiment with a method that admittedly has higher drilling and blasting costs.

In explosives casting, large amounts of low-cost ammonium nitrate mixtures are loaded into medium-sized drill holes in a usual ratio of more than 1 lb of powder per cu yd of overburden. The explosives charge is detonated through millisecond delay electric blasting

caps. When the shot is fired, a large part of the overburden is blasted into the pit away from the highwall and up on the spoil pile where it attains a favorable angle of repose.

Because of this casting action, the work of the primary stripping unit is greatly reduced. In fact, mines now casting with explosives report that 30 to 50% of their overburden needs no handling at all. Stripping capacity, therefore, is boosted which means that an operator can uncover more coal in less working time without adding new equipment.

Dragline operations benefit additionally because these units, instead of working off the shot bank, may be positioned on the spoil pile. This advantage practically eliminates the need for recasting. It also reduces reclamation time for bulldozers used to smooth out a "walking" path.

How One Operator Does It

Banks must be designed and prepared properly for best results. For example, here's how one stripping with a 50-ft sandstone burden prepares its bank for shooting. Five rows of holes are drilled on 12-ft burdens with 15-ft spacings. Four rows are 6¼-in-diameter holes while on the outside row, 7½-in-diameter holes are used to insure the desired movement of the toe. Hole depths average 45 ft. The powder factor varies with the row and averages 1.2 lb per cu yd. Two millisecond delay electric blasting caps per hole are used to assure maximum movement, with the delay pattern running 1, 2, 3, 4 and 5 in that order from the front row to the last row.

This stripping operation moves a minimum of 35% of the overburden without the use of equipment and uncovers 35 to 40% more coal in the same time. Even though drilling and blasting costs are higher, mining profits are greater because of increased production.

WELL-BROKEN MATERIAL from the highwall at left is typical of results achieved from the energy in explosives. Over 35% of the overburden at this western Pennsylvania stripping operation is moved into the spoil pile to rest at the natural angle of repose. This shot employed vertical drill holes. A new technique, using inclined blastholes, appears to be capable of producing even greater throw and better fragmentation with no deterioration of coal seams.



Analysis of operating costs at a stripping operation

1. Fixed Factors

Dragline:	Total operating cost, \$22 per hr. Working capacity 4.5 cu yd, 219 cu yd per hr, efficiency 60%, dumping radius 135 ft, maximum overburden height less than 100 ft.
Overburden:	10,000 cu yd volume per shot, ratio 10:1, height 60 ft (40 SS, 20 SH).
Coal:	Thickness 6 ft. Hauled by contract trucks.
Drilling:	5-in holes, 60 ft deep, at \$30 per ft.
Blasting:	AN-FO blasting agent at \$4.00 per cwt primed with 75% gelatin.

2. Present Operations (Breaking with explosives)

Overburden volume 10,000 cu yd loaded with 2,500 lb AN prills field mixed, powder factor 4:1. Shooting five 5-in holes, 60 ft deep, 30-ft spacing on 30-ft burden. Dragline works off shot bank, casting across 75-ft pit to spoil.

2a. Present Costs (1000 tons/day)

	Cost per Cu Yd
Drilling: 300 ft \times \$ 0.30 per ft = \$ 90.00	\$0.009
Blasting: 2,500 lb \times 4.00 per cwt = 100.00	0.010
Dragline: 45 hr \times 22.00 per hr = 990.00	0.099
Total stripping costs	\$1,180.00 \$0.118

3. Proposed Operations (Casting with Explosives)

Overburden volume 10,000 cu yd, loaded with 10,000 lb of AN prills field mixed, powder factor 1:1. Shooting twenty 5-in holes, 60 ft deep, 15-ft burden on 15-ft spacing. Dragline works on spoil pile. 40% moved by explosives.

3a. Probable Costs

	Per Cu Yd
Drilling: 1,200 ft \times \$0.30 per ft = \$ 360.00	\$0.036
Blasting: 10,000 lb \times 4.00 per cwt = 400.00	0.040
Dragline: 27 hr \times 15.00 per hr = 594.00	0.059
Total stripping costs	\$1,354.00 \$0.135

4. Comparisons

Present Operations: It takes 45 hr to strip 10,000 cu yds at daily strip rate of 1,818 cu yd per 8-hr shift to maintain production rate of 1,000 tpd. Stripping cost per day is \$214.50 which, divided by 1,000 tpd, is equivalent to \$0.214 per ton.

Proposed Operations: It will take only 27 hr to strip 10,000 cu yd at daily strip rate of 2,962 cu yd per 8-hr shift. This strip rate is 63% higher, uncovers 63% more coal per day. Thus, stripping cost per day, \$401.00, divided by increased tonnage per day (1,630 tpd) is equivalent to \$0.245 per ton.

5. Conclusions

1. Total cost per ton is only \$0.031 more.
2. Stripping capacity is increased 68%—from 219 to 370 cu yd per hr.
3. Coal production is increased 63%—from 1,000 to 1,630 tpd.
4. No capital expenditures are required.

Actual cost records are not available from this mine. Therefore, it is not possible to show exactly how increased production more than makes up for additional drilling and blasting expense. However, by using accepted cost figures, as shown in the accompanying analysis of costs, a hypothetical case may be easily made out for converting to explosives casting.

Since explosives casting is successful in western Pennsylvania, is there any reason why it couldn't be used in all areas where stripping is done? This is an important question because surface mining accounts for about 40% of the anthracite coal and 30% of the bituminous coal now produced in the United States. Nearly all of these surface mines use the strip mining method and are therefore potential users of explosives casting.

Six states—Ohio, Illinois, Pennsylvania, West Virginia, Indiana and Kentucky—account for 85% of the strip production and 25% of the total production of coal mined in the United States. In these six states are located 1,333 of the 1,728 strip mines in the United States.

Checklist Of Strip Mine Conditions

1. Favoring Explosives Casting:

- (a) deep, hard, overburden requiring extensive shooting
- (b) dumping radius of primary stripping unit less than 150 ft
- (c) narrow, steep, cuts—60 to 100 ft wide
- (d) undercapacity of primary stripping unit
- (e) overcapacity of coal mining unit
- (f) ability to use least expensive AN-FO explosive

2. Unfavorable for Explosives Casting:

- (a) overburden shallow and easily excavated
- (b) cuts more than 100 ft wide
- (c) poor conditions (water, etc.) for bulk AN-FO
- (d) possible need to run haulage road past stripping unit

To answer this important question, a preliminary study of widely separated stripping operations was made by the Explosives Div., Atlas Powder Co., in early 1960 to determine where explosives casting is technologically feasible.

Thirteen surface mines in the above states were visited in order to observe different geological conditions, types of mechanical equipment

and overburden moving practices. The study turned up a fairly complete range of normal operating conditions for surface mines. These included large and small pits, shovel and dragline operation, contour and flat stripping, use and non-use of explosives, and hard and soft cover.

Several basic similarities among these mines appeared in the study. All stripping ratios indicated moderately deep to very deep overburden and ranged from 12:1 to 21:1. Ammonium-nitrate mixtures are the major choice for the main charge of explosives in ratios ranging from 0.50 lb to 0.20 lb of powder per cu yd of overburden. Vertical drill holes are used universally.

Differences in operating methods, however, also are evident. In the central states, flat mining prevails and the pits are generally large and wide. Big shovels up to 70-cu-yd capacity are the rule for the larger pits with a few small-to-medium-sized draglines operating in some of the smaller pits. Overburden is composed mainly of the softer sandstones and shale. Drill holes are large and on wide spacings.

In the eastern states, however,

draglines are more popular due to the need for contour stripping in this hilly country. Pits are deep and narrow and the overburden is composed of the harder sandstones and limestones. Heavier loading is necessary and it is not uncommon to use nearly 1 lb of powder per cu yd of material. Holes are drilled smaller and closer together.

Since casting overburden to spoil is the common denominator of all these stripping operations, it would appear that explosives casting, since it does part of this work in place of mechanical equipment, would have application in all these areas. Actually, as the study showed, the method of operation determines whether explosives casting can be applied.

Factors To Consider

Depth and hardness of the overburden and the width of the pit are the two most important factors affecting the use of explosives stripping. If the overburden is soft enough to be easily stripped by mechanical equipment and is not very deep, explosives casting is obviously impractical. On the other hand, deep, hard overburden requiring extensive shooting merely requires a revision of existing blasting techniques to cast with explosives energy.

Width of the pit is a true variable. Shovel pits often are extremely wide to provide the required maneuverability since the shovel usually operates in the pit. A wide pit is unfavorable to explosives casting because of the distance to be bridged by the blast and the extra-heavy powder charge required to bridge it. Also, some wide shovel pits have main coal haulage roads running past the stripping shovel. Obviously, these couldn't be maintained when explosives are used for casting.

In general, hard, dense, deep overburden in pits where draglines work makes the best situation for converting to this new method. Draglines need less room for maneuvering, and consequently, pits are usually narrow and steep. The pit is easy to bridge by blasting the bank with a heavier than normal, but not excessive, powder charge.

Vertical holes drilled with rotary equipment are preferred for loading banks because greater density can be obtained and consequently great-



WITH EXPLOSIVES CASTING the dragline can be positioned on the spoil pile instead of on the highwall. The operator has better control of the elevation of the spoil and its levelness. This, in addition to thorough breakage of overburden, helps reduce bulldozer reclamation work.

er explosive energy is developed. The use of millisecond delay electric blasting caps detonated at the bottom of the borehole produces maximum confinement and control. The first delays are set off near the base of the highwall. This tends to throw the toe outward and up, and weakens the bank behind so that succeeding holes throw farther as they are detonated. Burden and spacing ratios are varied according to hardness of the overburden and the nature of the rock. Vibration and noise are controlled by the delay firing series.

Some strip mine operators believe that the effectiveness of explosives casting depends a great deal on bottom initiation and the use of millisecond delay electric blasting caps. Control is more exact, providing the maximum amount of heaving action.

Normally, instantaneous, or No. 1 delay caps are used in the front row with No. 2 or No. 3 caps in the second, and longer delays in the back row. The number of rows depends, of course, on the overburden volume. Three rows are considered an optimum number.

Selection of primers is important. It is generally agreed that high-velocity, high-density primers are essential in shooting with ammonium-nitrate mixtures. Many suitable primers are available. Some are made of

Composition "B", others of a combination of TNT and PETN known as Pentolite, and still others are made of gelatin dynamites. There are also surplus military explosives.

Laboratory studies indicate that military explosives contain greater energy and are probably the most effective primers. However, they cost about twice as much as the ammonia or nitroglycerine gelatin primers.

Atlas Powder Co., for example, offers three types of primers for shooting AN. The Super G Booster, a non-NC stick explosive, is very powerful but relatively insensitive. Equally effective, but less expensive, is the Giant "75" primer, a 75% ammonia gelatin dynamite in 2 x 8-in sticks. The most powerful primer is RXL-217, a 60% Petrogel.

Regardless of the primer used, most operators prefer to prime the charge top-and-bottom. Some states require double priming.

Here's a possible drawback to consider. There's no question that shooting heavily loaded vertical holes may seriously damage the underlying coal seam if the bank is not properly engineered for this type of shooting. It's very important, therefore, to work out a satisfactory technique for engineering spacings, burden and hole depths in relation to the coal seam. When this is done, it is

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reported, no appreciable deterioration of coal occurs.

There's a strong possibility, however, that this drawback may be eliminated by revising the drilling techniques now being used. The most promising new development is drilling inclined holes on angles as acute as 45 deg from vertical. Experiments by Dr. Boris Kochanowsky of the School of Mineral Industries, Pennsylvania State University, indicate that inclined drill holes practically eliminate any chance of coal deterioration because the main force of explosives energy is exerted at a right angle to the pitch of the inclined drill hole. That is, instead of the normal horizontal movement of vertical holes, accompanied by downward stressing, the shot material moves up and out at a pronounced angle with a corresponding reduction in downward stressing. The tests indicate that shooting inclined holes results in greater "throw" and better breakage.

Several of the major drill manufacturers have equipment available for drilling large-diameter holes on an incline. Loading an inclined hole, however, may be more difficult than loading vertical holes. Since poured ammonium nitrate mixtures tend to bridge somewhat even in vertical holes, it is presumed that bridging will affect inclined holes even more. It may be advisable to use cartridge AN to eliminate the possibility of voids. Another likely solution is the use of mechanical loading equipment such as the recently-introduced mobile pneumatic loader. This unit, mounted on a truck chassis, consists of a storage tank body which feeds AN into a positive pressure pump. Inside the pump, low pressure air is metered into the AN, forcing it through a flexible pipeline down into the hole. Mobile pneumatic loading units are now being used successfully in the anthracite region.

Conclusion

Time will tell about the potential of explosives casting. Perhaps, with new technological advances such as inclined drilling and bulk pneumatic loading, explosives energy may ultimately come close to the ideal of instantaneous, economical, uncovering of coal. Some coal operators and explosives engineers believe this could happen in the immediate future—at all types of strippings.



Bethlehem Wire Rope in the Adirondacks. You're looking at a huge quarry in upstate New York. The hoist rope on the loading shovels is Bethlehem 1¼-in. Form-Set Purple Strand, Lang Lay, with IWRC. Many of the other loading shovels at this operation are rigged with hard-working Bethlehem Rope. Heavy-duty service like this is the best way to appreciate the dependable performance that only a top-quality rope can deliver.



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The Manitowoc Model 4500 VICON represents the most outstanding advancement of excavator design in decades. Here is a 6 yard shovel or 7 yard dragline incorporating new, tested design principles to give you more yardage in less time than any other mechanical or electrically driven shovel-drag in this size range. Thoroughly proved on the job for over three years, VICON design has increased yardage 25% or better, substantially reduced maintenance costs, and piled up more profits for owners. Some exclusive VICON features are:

INTEGRATED CONTROLS that serve both as clutch operating levers and as engine throttles, providing variable speed control over each function. Clutches, being responsive to lower range of control pressures, are engaged before engines are accelerated. Slippage and overheated friction surfaces are eliminated, lengthening clutch life appreciably.

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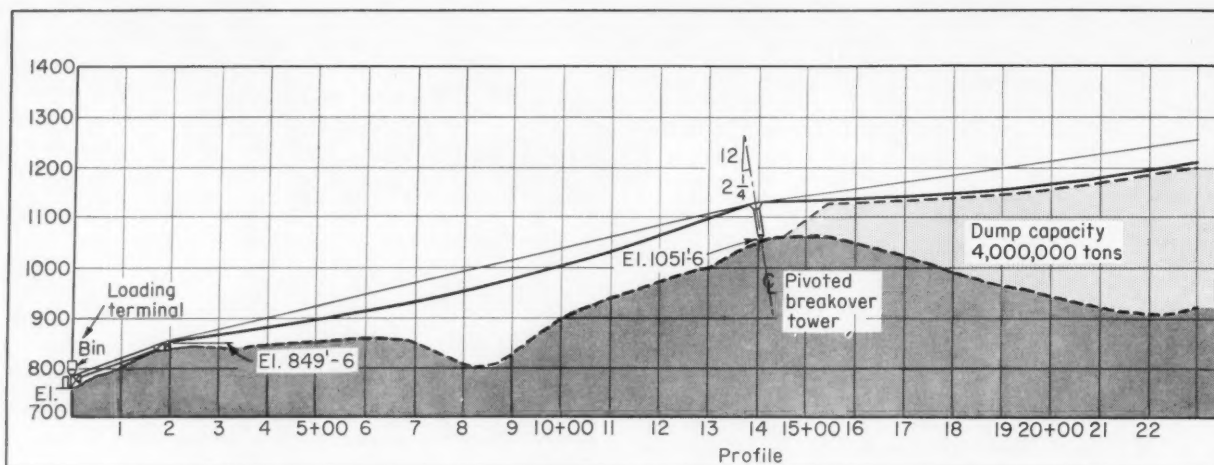
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RUGGED TERRAIN and lack of refuse disposal area in valley led to installation of automatic aerial tramway.



LEAVING PLANT, refuse bucket travels on rails for short distance and completes trip over mountain on wire ropes.



PROFILE of aerial tramway shows disposal area for 4 million tons in next valley. Dump capacity can be increased by increas-

Automatic Refuse Disposal

AN AUTOMATIC AERIAL TRAMWAY solves the problem of refuse disposal in rugged mountainous terrain at Rochester & Pittsburgh Coal Co.'s O'Donnell No. 2 mine, near Gilmer, W. Va.

Operating three shifts, the aerial tramway carries a 5-ton payload of refuse across the mountain every 4½ min. Once the aerial tramway is put in operation by pushbutton the automatic controls and protective devices take over and keep the tramway shuttling back and forth between the preparation plant and disposal area.

R & P management cites a number of reasons for choosing the automatic aerial tramway. For instance,

little or no refuse disposal area was available near the preparation plant in the valley. As a consequence, it would have been necessary to build an expensive, twisting road across the mountain to the present disposal area. Furthermore, to maintain such a road and trucks would have added considerably to the refuse disposal cost.

The aerial tramway carries 70 tph to the disposal area which will provide storage for 4 million tons of refuse, or enough to handle plant requirements for about 20 yr. Then, by changing the position of the terminal tower, the company will be able to extend the life of the disposal area.

How the Tramway Operates

To operate the tramway automatically, a worker sets the controls in the automatic position when the bucket is under the refuse bin and pushes the reset button. The air-operated gate under the bin opens, and feeds refuse to the bucket. When the weight of material in the bucket reaches a preset limit, the gate automatically closes. If there is insufficient refuse to fill the bucket, a timing device automatically closes the bin gate.

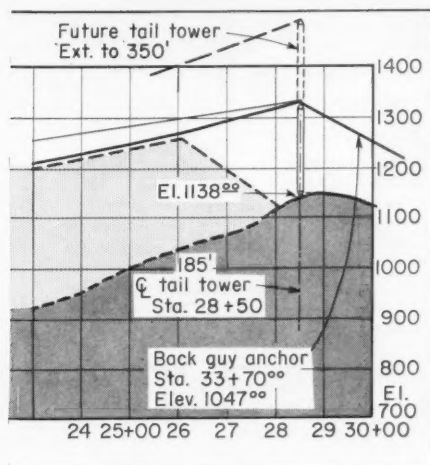
When the gate closes, contactors start the 150-hp wound-rotor motor that accelerates the bucket. After moving a short distance on track, the bucket travels on two wire ropes



DISCHARGE POINT is valley which will hold 4 million tons of refuse. System handles 70 tph of plant reject.



CHECK of all protective devices for automatic aerial tramway is made in control room at the start of each shift.



ing height of the tail tower.



R & P SUPERVISORS—P. A. Cottardi (seated, left), assistant production manager; T. A. Perry, superintendent; J. R. Cunningham, chief clerk; J. L. Henley (standing, left), chief electrician; J. G. Wiley, electrical engineer; and P. R. Ferguson, resident engineer are key men at O'Donnell No. 2 mine.

until it reaches its outer limit over the disposal area. This outer travel limit is controlled by an adjustable cam-operated limit switch which is driven by an idler sprocket in the drive house. This switch stops the drive and plugs the motor in the reverse direction. As the bucket starts the return trip a ratchet-type device trips the door, releasing the refuse.

The bucket also has an "in" limit switch which is also driven by a cam on the same shaft as the outer limit switch. As the bucket approaches the bin the "in" limit switch operates an air brake which stops the bucket. After about 5 sec, the brake releases and a 15-hp motor takes over and brings the bucket in slowly.

As the bucket nears the loading position the 15-hp motor cuts out and the bucket drifts a very short

distance to the loading position. The automatic cycle is then repeated.

Protective Devices

To make the automatic refuse-disposal system virtually foolproof the following protective schemes were built into the system:

1. Normal motor overload protection.
2. Overload protection against the bucket returning loaded.
3. An outgoing travel timer that would cut off the motor before the bucket reached the terminal tower. The operating mechanism for this device is mounted on the outer track ropes.
4. A centrifugal speed switch to prevent overspeeding. In event of overspeeding, this device would cut the control power and set the brake.

5. A pressure switch that sets the brake if the compressed air fails.

6. A magnetic relay which provides backup protection on the "in" limit switch and is designed to set the brake.

7. A device that cuts off the power as the bucket approaches the bin if the door fails to reclose.

8. Phase failure relaying.

9. Undervoltage protection.

At the beginning of each shift a worker checks all protective devices and also notes if the bucket-position indicator in the control room is operating properly. The refuse-disposal system operates automatically for the remainder of the shift.

Design and construction of the refuse system was handled by the Interstate Equipment Corp. Controls are Square D and some R & P innovations.

Maintenance Ideas

Welding Symbols

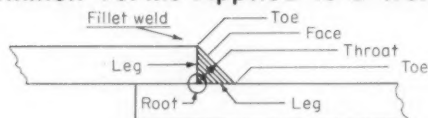
Arc and Gas Welding Symbols				
Type Of Weld	Arrow Side*	Other Side**	Both Sides	No Arrow-Side or Other Side Significance
Bead			Not Used	
Fillet				Not Used
Plug or Slot			Not Used	Not Used
Square				Not Used
V				Not Used
Bevel				Not Used
U				Not Used
J				Not Used

AWS welding symbols

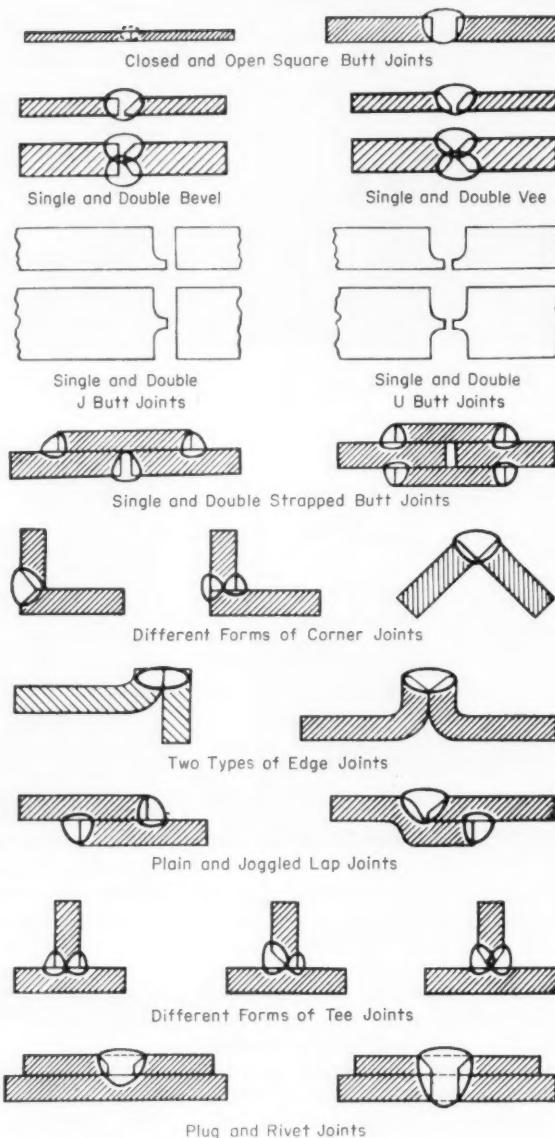
*ARROW SIDE is the side of the joint to which the arrow points (the near side).

**OTHER SIDE is the opposite (or far) side of the joint.

Common Terms Applied to a Weld



Types of Joints



Maintenance Arc Welding

ARC WELDING is one of the most important and widely used tools of maintenance departments. Its functions and equipment should receive the same care and attention as any other phase of the maintenance program. It cannot be regarded as a blacksmithing operation as it once was. The selection of welding equipment, classification of welding jobs, selection of proper electrodes and

welding procedure must be performed by experienced men.

Equipment Selection

Welding machines are manufactured in a variety of types and designs to fit any welding job. There is no standard procedure for selecting these machines. It is a matter of personal choice along with a knowledge

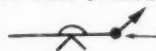
of the type of work that the machine is expected to do. Price and class of machine, desired performance and a reasonable operating cost are primary factors.

Sheet-Metal and Light-Welding Equipment—This application covers metals ranging from 22 gage to $\frac{3}{16}$ -in thick. The average welder prefers a DC machine with a capacity of

Welding Symbols

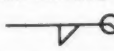
Supplementary Symbols

FIELD WELD SYMBOL



Field Weld Symbol indicates that weld is to be made at a place other than that of initial construction

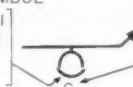
WELD-ALL-AROUND SYMBOL



Weld-All-Around Symbol indicates that weld extends completely around the joint

CONVEX-CONTOUR SYMBOL

Convex-Contour Symbol indicates face of weld to be finished to convex contour.



Finish Symbol (User's Std.) indicates method of obtaining specified contour but NOT degree of finish.

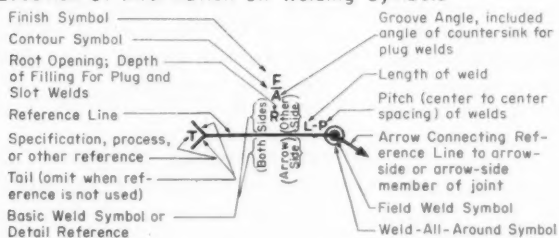
FLUSH-CONTOUR SYMBOL

Flush-Contour Symbol indicates face of weld to be made flush. When used without a finish symbol, indicates weld to be made flush without subtractive finishing.



Finish Symbol (User's Std.) indicates method of obtaining specified contour but NOT degree of finish.

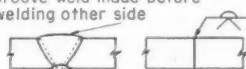
Location Of Information On Welding Symbols



Typical Welding Symbols

Use Of Bead Weld Symbol To Indicate Singlepass Back Weld

Groove weld made before welding other side



Desired Weld Symbol

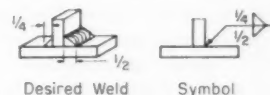
Size Of Surface Built Up By Welding



Desired Weld Symbol

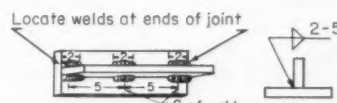
Typical Welding Symbols

Double Fillet Welding Symbol



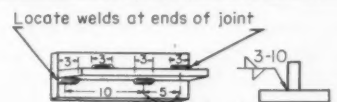
Desired Weld Symbol

Chain Intermittent-Fillet Welding Symbol



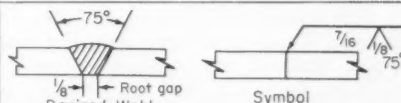
Desired Welds Symbol

Staggered Intermittent-Fillet Welding Symbol



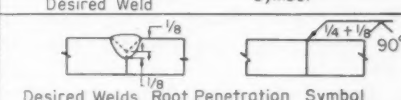
Desired Weld Symbol

Single V-Groove Welding Symbol



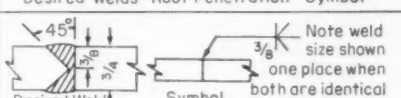
Desired Weld Symbol

Single V-Groove Welding Symbol Indicating Root Penetration



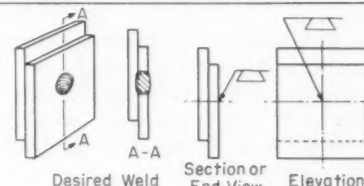
Desired Welds Root Penetration Symbol

Double-Bevel Groove Welding Symbol



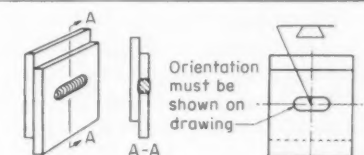
Desired Weld Symbol

Plug Welding Symbol



Desired Weld Section or End View Elevation

Slot Welding Symbol



Desired Weld Elevation Symbol

Hobart Bros. Co.

about 200 amp which has good control. Light welding also can be handled effectively with AC-generator type machines.

General-Purpose Welding Machines—This application covers welding shops and field work. AC and DC machines are used in both shop and field work. Normally, a 400 amp welder is adequate. However, it may be desirable to use a 300- or 500-amp machine, depending on the welding requirements. It is better to have a higher capacity welder for a wide range of jobs than to have one that

will only do some of the jobs. The number of machines necessary for a welding shop depends on the amount of work being done. Field crews should be equipped with a sufficient number of portable welders to do their work quickly and efficiently. This is especially true when more than one welding machine is needed on one or several locations at the same time.

Welding accessories, such as electrode holders, cables, etc., are important. A good rule-of-thumb in selecting accessories is to buy the best. It is the cheaper in the long run.

Quality accessories which have sufficient current-carrying capacity will last longer.

Electrode Selection

There are two important factors to consider when selecting electrodes: (1) electrode coating and core-wire analysis and (2) electrode diameter. Correct selection will make a good weld under a given condition.

Before the proper electrode can be selected certain information must be known, including:

1. Position of work.

Maintenance Ideas

2. Type and thickness of metal to be welded.

3. Type of welder, AC or DC, capacity, etc.

4. Weld requirements.

Mild- and low-alloy-steel electrodes are classified with a numbering system. The number E-6010, for example, is a four digit classification. The letter "E" designates a metal arc-welding electrode. The first two digits indicate the minimum allowable tensile strength of stress-relieved deposits in thousands of pounds per square inch. The third digit indicates the welding position or positions in which the electrode will make a satisfactory deposit. The last digit indicates various arc characteristics such as polarity, etc.

Approximately 90% of all arc welding is done on steel material. Many types of steel electrodes are available for this application, ranging from general-purpose (mild-steel) electrodes to stainless-steel electrodes.

Basically there are three types of electrodes:

1. Bare metallic.
2. Carbon arc.
3. Shielded metallic.

Bare-Metallic Electrode—In metallic arc welding the heat of the arc is used to melt the work metal and the electrode. This electrode has decreased in popularity since the coated electrode came into use.

Carbon-Arc Electrode—An arc is formed between a carbon electrode and the work metal. The heat which is formed is used to melt the work metal. A filler rod is used to complete the weld.

Shielded Metallic-Arc Electrode—This electrode uses a coating to protect the molten filler metal while passing across the arc and solidifying in the joint. It provides more heat than the bare metallic arc. The electrode melts more quickly and the metal is in a more fluid condition, thus increasing the welding operation. It is easier to handle and is more stable. These electrodes are more commonly known as coated electrodes. Some examples are as follows:

Mild Steel—general purpose electrodes are used for welding steels of 0.25% carbon or less.

Low-Alloy Steel—mild-steel electrodes containing small quantities of alloys added to the coating to increase the tensile strength to maintain the strength of the base material.

Iron Powder—mild-steel electrodes with powder added to the coating which forms additional metal for the weld, thus increasing speed and deposition.

Low-Hydrogen Electrodes—specially-formulated electrodes (with or without iron powder) containing very little hydrogen to prevent underbead cracking and enable one to weld difficult steels with little or no preheating.

Hardsurfacing Electrodes—electrodes made specially for applications that are subject to impact and abrasion.

Cast Iron—electrodes made in two types, machinable and nonmachinable. Machinable are the nickel or nickel-alloy electrodes that require no preheating. Nonmachinable electrodes are made from a steel or cast iron core. The latter can be machined if preheated.

Non-Ferrous Electrodes—electrodes containing no iron, such as aluminum, bronze and brass electrodes.

Stainless-Steel Electrodes—electrodes designed for welding where corrosion or heat resistance is important. The analysis of the electrode is usually similar to the base metal. These electrodes also are commonly used for joining dissimilar metals or as an undercoat preparatory to hard-surfacing.

Maintenance Welding

Basically there are four situations which require maintenance welding: (1) fracture, (2) wear, (3) corrosion and (4) new construction.

Maintenance welding possibly requires more know-how than other forms of welding. This is especially true with regard to repairing fractures, wear and corrosion. This category provides a greater challenge to maintenance welders. Aside from knowing what to do in the many situations that confront him, the maintenance welder must do quality work in as short a time as possible to keep machine downtime at a minimum. If the maintenance welder is good he can repair broken machine parts

quicker than they can be replaced.

Most types of repairs are made on gray cast iron, cast steels, low- and high-alloy steels, brass, bronze and aluminum.

Dimensional stability during the welding process as well as afterwards must be determined. Distortion must be prevented to maintain this stability. Preheating before welding, post heating and slow cooling, use of alignment bars, and other precautions will prevent or at least minimize distortion.

Some repairs must be machined after welding to provide accuracy. Others can be made without extra precautions. However, service requirements usually require that repaired parts be stress relieved after welding and other reheated.

The maintenance welder must decide on the process best suited for making repairs of various jobs. Each repair job will have certain characteristics that will lend itself to a given process. The experienced welder will recognize these characteristics and use them to good advantage.

Proper electrode selection for the various jobs is important. The welder must know his metals and electrodes in order to justify his selection.

The welding joint must be prepared properly. Prescribed standards should be adopted to insure that weld joints are clean before welding.

It may not be possible to recruit experienced welders. However, it is possible to see that they get the necessary training to become good welders.

Welding Procedure

Besides the steady frying and crackling sound that a correct arc produces, the shape of the molten pool and the movement of the metal at the rear of the pool serve as a guide in checking weld quality. In a correctly made deposit the ripples produced on the bead will be uniform and smooth, with no overlap or undercut.

If the arc is too long the metal melts off the electrode in large globules which wobble from side to side as the arc wavers, giving a wide spattered and irregular bead with poor fusion between original metal and deposited metal.

If the arc is too short, there is not enough heat to melt the base metal

properly and the electrode quite often sticks to the work, giving a high, uneven bead, having irregular ripples with poor fusion and slag and gas holes.

If current on machine is too high or too low, the weld will not be good

enough. High current melts the electrode too fast and the molten pool is large and irregular. Low current will not produce enough heat to melt the base metal and the molten pool will be too small, pile up and look irregular.

When welding speed is too fast the pool does not last long enough, causing impurities and gas to be locked in. The bead is narrow and ripples are pointed. When speed is too slow the metal piles up causing the bead to be too high and wide.

Glossary of Electric Welding and Cutting Terms

USING CORRECT TERMINOLOGY in planning or instructing men in the field of electric welding will result in a better understanding and reduce the possibility of errors. Here are approved definitions from Bulletin C42.50 of the American Standards Association, published by the American Institute of Electrical Engineers.

Processes and Methods (General Terms)

Automatic Welding—Automatic welding is welding with equipment which performs the entire welding operation without constant observation and adjustment of the controls by an operator. The equipment may or may not perform the loading and unloading of the work.

Induction Welding—Induction welding is a welding process wherein coalescence is produced by the heat obtained from resistance of the work to the flow of induced electric current, with or without the application of pressure.

Machine Welding—Machine welding is welding with equipment which performs the welding operation under the observation and control of an operator. The equipment may or may not perform the loading and unloading of the work.

Manual Welding—Manual welding is welding wherein the entire welding operation is performed and controlled by hand.

Welding (Noun)—Welding is the metal-joining process used in making welds.

Materials and Equipment (General Terms)

Base Metal—Base metal is the metal to be welded or cut.

Bare Electrode—A bare electrode

is a filler-metal electrode, used in arc welding, consisting of a metal wire with no coating other than that incidental to the drawing of the wire.

Carbon Electrode—A carbon electrode is a non-filler-metal electrode, used in arc welding, consisting of a carbon or graphite rod.

Composite Electrode—A composite electrode is a filler-metal electrode, used in arc welding, consisting of more than one metal component combined mechanically. It may or may not include materials which protect the molten metal from the atmosphere, improve the properties of the weld or stabilize the arc.

Covered Electrode—A covered electrode is a filler-metal electrode, used in arc welding, consisting of a metal core wire with a relative thick covering which provides protection for the molten metal from the atmosphere, improves the properties of the weld metal and stabilizes the arc.

Lightly-Coated Electrode—A lightly-coated electrode is a filler-metal electrode, used in arc welding, consisting of a metal wire with a light coating applied subsequent to the drawing operation, primarily for stabilizing the arc.

Metal Electrode—A metal electrode is a filler- or nonfiller-metal electrode, used in arc welding, consisting of a metal wire, with or without a covering or coating.

Tungsten Electrode—A tungsten electrode is a nonfiller-metal electrode, used in arc welding, consisting of a tungsten wire.

Resistance Welding—The part or parts of a resistance-welding machine through which the welding current and, in most cases, pressure are applied directly to the work. The electrode may be in the form of a rotating wheel, rotating roll, bar, cylinder, plate, clamp, chuck or modification thereof.

Filler Metal—Filler metal is metal to be added to making a weld.

Welder—A welder is one who is capable of performing a manual or semi-automatic welding operation.

Welding Generator—A welding generator is a generator used for supplying current for welding.

Welding Machine—A welding machine is the equipment used to perform the welding operation. For example, spot-welding machine, arc-welding machine, seam-welding machine, etc.

Welding Transformer—A welding transformer is a transformer used for supplying current for welding.

Welding Details (General Terms)

Weldability—Weldability is the capacity of a metal to be welded under the fabrication conditions imposed into a specific, suitably designed structure and to perform satisfactorily in the intended service.

Welding Current—Welding current is the current flowing through the welding circuit during the making of a weld. In resistance welding the current used during preweld or postweld intervals is excluded.

Processes and Methods (Arc Welding)

Arc Welding—Arc welding is a group of welding processes wherein coalescence is produced by heating with an electric arc or arcs, with or without the application of pressure and with or without the use of filler metal.

Atomic Hydrogen Welding—Atomic hydrogen welding is an arc-welding process wherein coalescence is produced by heating with an electric arc maintained between two metal elec-

Maintenance Ideas

trodes in an atmosphere of hydrogen. Shielding is obtained from the hydrogen. Pressure may or may not be used and filler metal may or may not be used.

Impregnated - Tape Metal - Arc Welding — Impregnated-tape metal-arc welding is an arc-welding process wherein coalescence is produced by heating with an electric arc between a metal electrode and the work. Shielding is obtained from decomposition of an impregnated tape wrapped around the electrode as it is fed to the arc. Pressure is not used and filler metal is obtained from the electrode.

Inert-Gas Carbon-Arc Welding — Inert-gas carbon-arc welding is an arc-welding process wherein coalescence is produced by heating with an electric arc between a carbon electrode and the work. Shielding is obtained from an inert gas such as helium or argon. Pressure may or may not be used and filler metal may or may not be used.

Inert-Gas Metal-Arc Welding — Inert-gas metal-arc welding is an arc-welding process wherein coalescence

is produced by heating with an electric arc between a metal electrode and the work. Shielding is obtained from an inert gas such as helium or argon. Pressure may or may not be used and filler metal may or may not be used.

Metal-Electrode Arc Welding — Metal-electrode arc welding is a group of arc-welding processes wherein metal electrodes are used.

Shielded Carbon-Arc Welding — Shielded carbon-arc welding is an arc-welding process wherein coalescence is produced by heating with an electric arc between a carbon electrode and the work. Shielding is obtained from the combustion of a solid material fed into the arc or from a blanket of flux on the work or both. Pressure may or may not be used and filler metal may or may not be used.

Shielded Metal-Arc Welding — Shielded metal-arc welding is an arc-welding process where coalescence is produced by heating with an electric arc between a covered metal electrode and the work. Shielding is obtained from decomposition of the

electrode covering. Pressure is not used and filler metal is obtained from the electrode.

Shielded Stud Welding—Shielded stud welding is an arc-welding process wherein coalescence is produced by heating with an electric arc drawn between a metal stud or similar part, and the other work part, until the surfaces to be joined are properly heated, when they are brought together under pressure. Shielding is obtained from an inert gas such as helium or argon.

Stud Welding—Stud welding is an arc-welding process wherein coalescence is produced by heating with an electric arc drawn between a metal stud, or similar part, and the other work part until the surfaces to be joined are properly heated, when they are brought together under pressure, and no shielding is used.

Submerged Arc Welding — Submerged arc welding is an arc-welding process wherein coalescence is produced by heating with an electric arc or arcs between a bare metal electrode or electrodes and the work. The welding is shielded by a blanket of granular, fusible material on the work. Pressure is not used and filler metal is obtained from the electrode and sometimes from a supplementary welding rod.

AT FLOOD CITY:

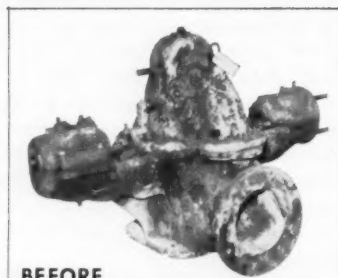
PUMP REPAIR and MAINTENANCE

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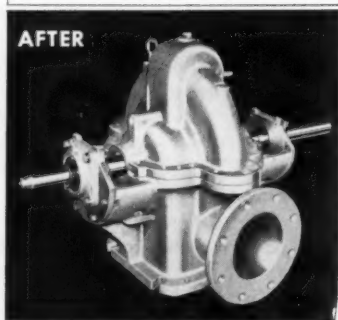
- Personalized Service simply means that Flood City personnel is thoroughly trained to provide individual rebuilding and repairing techniques peculiar to practically any make of water pump fast and easily.
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BEFORE



AFTER

Materials and Equipment (Arc Welding)

Electrode Holder — An electrode holder is a device used for mechanically holding the electrode and conducting current to it.

Electrode Lead—An electrode lead is the electric conductor between the source of arc-welding current and the electrode holder.

Ground Connection—A ground connection is the connection of the work lead to the work.

Metal Electrode—A metal electrode is a filler or nonfiller metal electrode, used in arc welding, consisting of a metal wire, with or without a covering or coating.

Reactor—A reactor, in arc-welding circuits, is a device used for the purpose of minimizing irregularities in the flow of welding current.

Work Lead—A work lead is the electric conductor between the source of arc-welding current and the work.

operators report on SEPARAN AP30 flocculant

Here are reports of results from a few of the many operators who have shifted to Separan® AP30 flocculant. Notice the important savings in material costs, the improved wash water clarification and the increased capacity of existing equipment.

A Kentucky coal company found that Separan AP30 made possible satisfactory clarification of wash water without adding expensive new equipment. Using starch, an overflow of clear wash water could not be maintained past mid-morning on Monday, after the normal weekend shutdown. When a 0.05 per cent solution of Separan AP30 was substituted, clear water was maintained at an average depth of 42 inches in the thickener during the entire workweek.

In one 18,000 ton-per-day plant, Separan AP30 was used to maintain clear-water overflow in three thickeners despite 15 per cent solids in the feed water. The cost of using Separan AP30 was only \$0.03 per ton of fines.

In a 20,000 ton-per-day Pennsylvania plant, 14 pounds of Separan AP30 per shift replaced 200 pounds of cornflour. 50 inches of clear water was maintained in the refuse thickener.

A West Virginia operator maintained clear-water overflow from an 85-foot thickener with 11 pounds of Separan AP30 per day. Cost was about half that of starch, used previously.

In a 23,000 ton-per-day plant, 12,000 gallons of water per minute, containing one per cent solids, was treated successfully with Separan AP30. Cost was \$0.015 per ton of fines.

Another Pennsylvania plant of 18,000 ton-per-day capacity required only two pounds of Separan AP30

per shift to maintain the desired level of clear water. Previously 100 to 200 pounds of starch per shift had been required.



This proportioning pump and related equipment is used to make on-location tests of Separan AP30. These tests help the operator estimate just how much he can save by using Separan AP30.

If you are not using Separan AP30, arrange for a demonstration at your plant right away. There's no obligation. Just contact Dowell at 1918 Highway 41, North, Evansville 7, Indiana. The telephone number is HARRISON 5-1353. Or, contact B. E. Scott at 197 Monterey Drive, St. Albans, West Virginia. His telephone number is PARKWAY 7-2895.

PRODUCTS FOR THE COAL INDUSTRY

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY



PREPARATION PLANT ADDITIONS (left) have improved the quality of coal and reduced operating costs. The new dense-medium washer has a capacity of 700 tph.



COAL IS CONVEYED to the plant via a 1,490-ft rope-and-button line.

Preparation plant improvements have widened Glogora Coal Co.'s profit margin and increased market potential through . . .

Greater Efficiency, Higher-Quality

New giant washer is capable of cleaning 700 tph of "Blue Pennant" coal with low magnetite consumption.

SUBSTANTIAL GAINS in plant efficiency—up to 12%—and higher quality products are the results of redesigning the preparation plant at Glogora Coal Co., Blue Pennant, W. Va. It took a 700-tph Daniels dense-medium washer and associated equipment to effect the improvements initially established by the company.

When investigations first started to determine the potential value of precision preparation the coal market had leaned strongly to the buyers' side so that it became more essential than ever to provide the mine with a positive means for producing the quality coals demanded by consumers. In addition, the cleaning facilities

must of necessity be capable of economical performance well beyond that of the washing system in use up to 1959.

Washability studies revealed a significant loss of coal, the presence of migrant material in the coal product which increased the ash analysis of the loaded coal beyond a point acceptable to the trade, and other weaknesses including a high mining cost due to the necessity for selective mining at the face. The investigation showed that modern preparation methods would provide the following advantages:

1. Reduction in ash analysis of the

loaded coal to the point where it could be marketed attractively.

2. Practical elimination of coal losses due to washing inefficiency.

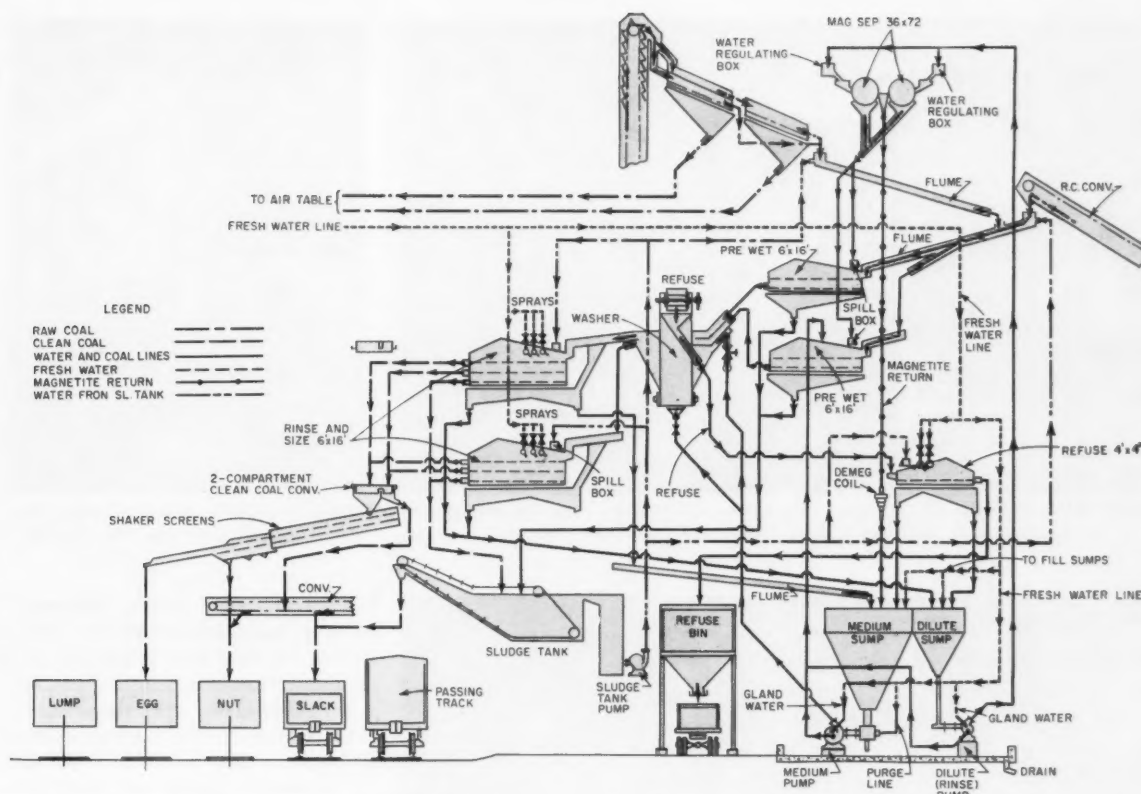
3. Relief of the overloaded fine-coal washing system by diverting the bulk of the fines to a dense-media bath.

4. Significant saving in mining cost since less care would be required at the working face.

5. Possibility and practicability of reducing plant working time from two shifts to one shift.

Economies of the installation were governed by the existing preparation methods and the physical installation conditions.

The plant consisted of a hydro separator and two air cleaners which together with their complex loading and recirculation accessories were in-



COALFLOW at Glogora Coal Co.'s plant after improvements were made. Construction and installation of new facilities and the tie-in with the existing plant were made without loss of operating time.

Products

stalled in a building which made a figure "L" between the roadway and the loading tracks. Sufficient space was available for the new facilities to be installed in the open area of the "L". The new preparation system was selected on its ability to accurately separate coal from its impurities, to insure the absence of undesirable material in the coal, and as a corollary, to insure the complete absence of coal in the discarded refuse. The dense-media washer and the actual preparation system selected was a Daniels DMS Precision coal washer.

Company Background

Glogora Coal Co., was incorporated in 1920 with operations at Stickney, W. Va. and Glo, Ky. These operations have since been exhausted. General

offices were at Huntington, W. Va. The Blue Pennant operation which is located on the Coal River Div. of the Chesapeake & Ohio Ry. at Blue Pennant, W. Va., was started in 1929. Originally, the Dorothy seam was mined but later discontinued after the Five Block seam was developed. This seam is mined exclusively at the present time. The office of the affiliate sales company, the Middle West Coal Co., has recently moved to Huntington where both operating and sales activities are conducted. The entire production of Glogora Coal Co.'s "Blue Pennant" Coal is sold by the Middle West Coal Co. Incidentally, "glogora" is a Welsh word meaning "the best coal".

Coal Source—The Five Block seam averages 72 in in thickness. The top consists of slate and sandstone and the bottom of slate and fireclay. Conventional mining equipment, including Jeffrey cutters, loaders and shuttle cars are used throughout the operation. Coal is moved from the operating sections to the headhouse in 6½-ton end-dump ACF mine cars.

Haulage locomotives are divided into section and mainline units. Distance from the face to the headhouse is approximately 4 mi.

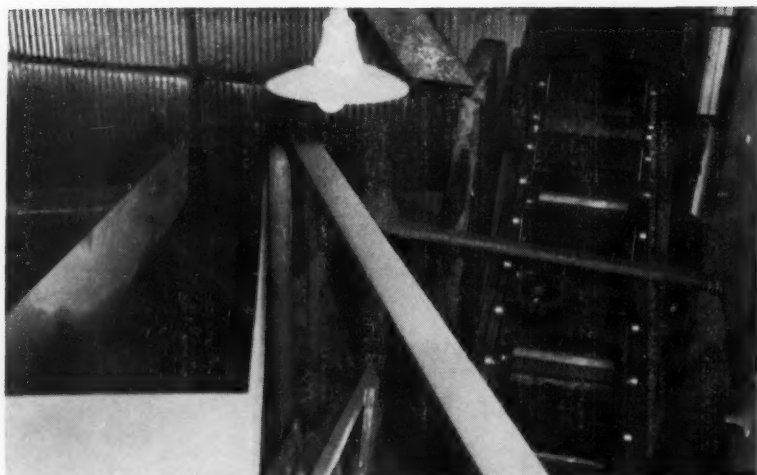
Coal is end-dumped and fed into a rope-and-button line which carries it 1,490 ft to a 42-in raw-coal belt conveyor in the plant.

Preparation Cycle

Coal from the 42-in raw-coal conveyor discharges onto a classifying shaker where three sizes are made, including plus 8-in, 8x1¼ and 1¼x0. Plus 8-in is hand picked and loaded into railroad cars.

The 8x1¼ is transferred by chain conveyor to a flume which takes it to two 6x16 Allis Chalmers prewet vibrators. The 1¼x0 product from the classifying screen is elevated and discharged onto two 6x16 Allis-Chalmers Ripl-Flo vibrators equipped with ¾-in slotted-cloth screens. Each vibrator handles half of the feed from the elevator. Two sizes of raw coal are made, including 1¼x¼ and ¼x0.

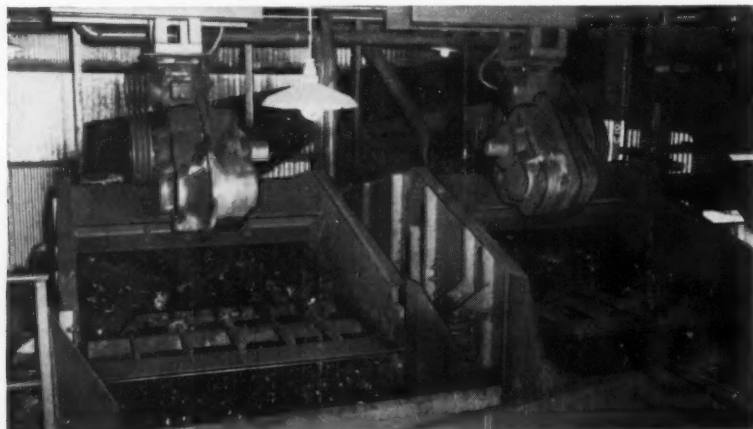
The ¼x0 goes to two Roberts & Schaefer air cleaners located under



RAW-COAL PRODUCTS, 8x1¼ and 1¼x¼, are combined and flumed to two prewet screens which discharge into the washer without chute correction.



WASHED COAL is floated onto two triple-deck 6x16 rinse and size vibrators.



PREWET SCREENS feed the 700-tph dense-medium washer. Present feed is 340 tph.

the two Ripl-Flo vibrators. Clean coal is then passed over two 3x6 Allis-Chalmers vibrators to make ¼x½ and ½x0 products. These two products are loaded into railroad cars.

The 1¼x¼ product from the Ripl-Flo vibrators is discharged into a flume and transferred with water to combine with the 8x1¼ product on the two prewet screens.

An additional vibrating screen was added to the raw-coal separation circuit to improve the removal of ¼x0 coal and to provide additional capacity in the over-all preparation system. A method was then devised to collect the oversize from the vibrating screens and deliver it by flume to the conventional prewet screens which are an essential and critical component of any dense-media system. The flume was divided into two compartments. This flume provided

an inexpensive method of transporting, mixing and wetting of the raw coal before discharging onto the prewet screens.

The prewet vibrators are equipped with a 1¼-in-round perforated plate on the upper deck and ¾-in-round perforated stainless-steel plate on the lower deck. Each vibrator has a water box suspended above it to provide additional soaking and washing of the coal, using the tailings water from two magnetic separators.

The 8x¼-in product, made up by combining the 8x1¼ from the classifying screen and the 1¼x¼ from the Ripl-Flo vibrators, passes over the two prewet screens. All undersize material (½x0) is removed and deposited in the sludge tank. The product is washed and blended with modified coal.

The prewet screens feed into the

DMS dense-media washer. This washer was manufactured in the shops of The Daniels Co., Bluefield, W. Va. In anticipation of large future production capacity, the unit, according to the manufacturer, is the largest single coal washer ever built. It has an ultimate capacity of over 700 tph. The unit is large enough to permit the two prewet screens to discharge into it in a straight line without chute corrections. The washer also discharges washed coal onto two finishing screens in a straight line, also without chute correction.

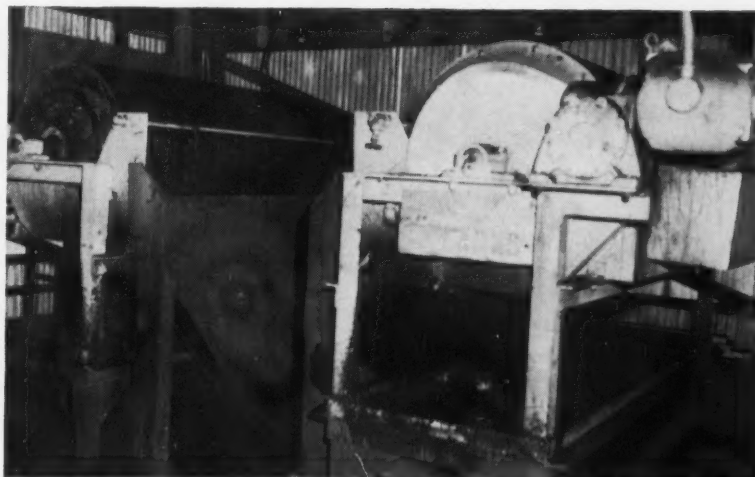
The present rate of feed to the dense-medium washer is 340 tph but it can be increased when conditions demand. All associated equipment can be adjusted to handle greater loads without changing or replacing the units.

Refuse from the washer goes by chute to a 4x14-ft Allis-Chalmers Low Head vibrator to be dewatered and chuted to the refuse bin for disposal by truck.

Clean coal overflows the weirs of the dense-media washer to two 6x16-ft Allis-Chalmers triple-deck Low Head vibrators. Each vibrator is equipped with a relief deck having 1¼-in-round perforated plate, stoker intermediate deck with ¾-in round plate and a stainless-steel medium washing deck with ½-in round plate. The sluice ahead of the vibrators is equipped with a 1½-mm stationary screen. These rinse-and-size vibrators are equipped with three banks of sprays containing five and six sprays each.



RINSE AND SIZE vibrators are equipped with 1¼-, ¾- and ½-in screens.



MAGNETITE RECOVERY is made by two 36x12-in separators using oriented ceramic magnets. Magnetite consumption is 0.448 lb per ton at a cost of \$0.0101.

Products made on these screens are 8x1¼, 1¼x¼, ¼x½ and ½x0. The 8x1¼ and 1¼x¼ go to a two-compartment conveyor. The 8x1¼ is discharged onto a Parrish-type classifying screen. Sizes made include 2x1¼ nut, 2x3 stove, 3x6 egg and 6x8 chunks. The 1¼x¼ (stoker) is transferred to another conveyor for loading into railroad cars. Bottom product (½x½) is loaded into railroad cars. The ½x0 goes to the sludge tank along with the bottom product from the prewet screens.

Products from the classifying screen can be loaded or crushed to any desired size. If other than standard sizes are needed the loading booms can be raised to discharge into a 30x36-in Gundlach crusher. Crushed coal is transferred to either of two double-deck Ripl-Flo vibrators. One vibrator is equipped with 2- and ¾-in screens and the other with 1¼- and ¾-in screens.

All medium-storage facilities and pumping systems are grouped in a common area on the ground floor of the plant. An interesting feature of the medium-circulating system is the use of a DMS hydraulic door at the bottom of the main medium storage sump. This replaces the conventional type pinch valve, plug valve or gate valve used to close the sump for maintenance or other emergency procedures. At Glogora the medium-circulation pump has a large-diameter intake. A conventional valve would have been expensive and subject to continued and significant maintenance cost. A conventional valve is



RICHARD SMITH, general manager, and **Robert Walker**, plant foreman, discuss preparation problems after the day's run and lay plans for the next shift.

exposed to wear because of the flow through it and yet may be used as infrequently as once a year. It is often necessary to replace parts on a conventional valve every 2 mo or oftener. The hydraulic door is virtually free of maintenance since the operating parts are not exposed to the flow from the storage sump through the medium-circulating pump. It also is possible to open or close the door in a matter of seconds as contrasted with the long winding periods associated with conventional plug or pinch valves. The door provides a convenient emergency receptacle for tramp material which might enter the sump accidentally and which could damage the pump.

Two drum-type Indox magnetic separators manufactured by the Stearns Magnetic Div. are used to

recover magnetite. Indox oriented ceramic magnets are used. Magnetite consumption record for the 6-mo period ending Dec. 30, 1960 showed that in cleaning 121,435 tons of coal the company used 547 bags of magnetite at a cost of \$1,226.25. Pounds used per ton was 0.448 resulting in a cost per ton of \$0.0101.

The changeover, including construction and installation of the new facilities and the tie-in with the existing plant, was made without loss of operating time. Daniels Co. has been complimented by H. B. Pierson, Glogora president, for the skill and facility shown in the design and construction of the new setup, made possible by the fine cooperation of H. J. Daniels, president; C. A. Peters, vice president; and A. F. Castanoli, consulting engineer.



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just right for your work!***

Whatever your mine and quarry hauling job may be — stripping overburden, waste disposal, moving ore, rock and other materials — there's a type and size of job proved Euclid that can cut costs and step up production. With unmatched field experience and the parts and service facilities of a world wide dealer organization, "Eucs" meet every requirement for big performance on the toughest jobs. For facts and figures proof that Euclid work-ability can mean lower costs and bring a better return on investment, call the Euclid dealer in your area.

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Rear-Dumps**

Reflections on . . .

Mine Management's Job In the Challenging Years Ahead

COAL AGE will be 50 years "young" next October. For the coal industry—and for us at *Coal Age*—it has been a significant and exciting half century—in mining, in preparation, in safety, in labor-management relations, and in markets and marketing. Now . . . everything indicates that one era in coal is ending and another is beginning—equally exciting, equally promising and equally demanding of managerial skill and talent.

Fifty years ago, no competition from oil and gas. And 50 years ago, the investment in equipment per working section (stripping was only a few per cent of the total) was less than \$5,000 (\$25,000 in 1960 dollars). Now, after a long and bitter struggle, coal is beginning to come back against competition, in part by investing \$150,000 or more in the average working section, with \$250,000 and more probably the rule in the future.

Key to the progress of every coal company in the new era—as in the past—is effective management—alert, inspired and knowledgeable operating and executive officials in every phase of operation, sales and related activities. Every *Coal Age* reader has a big job ahead—and a challenging personal opportunity—in contributing to the industry's progress in a new period of market expansion, automated production and final attainment of safety goals.

Five years from now bituminous output will be 525,000,000 tons plus. And five years from now you could very well be working with completely automated remotely-controlled mining units and super-super-stripping units (150 cu yd or better). And the bituminous fatality rate will be well under 0.40 per million tons.

With its first issue, **COAL AGE** started out with the promotion of machine mining as one of its major objectives. It has never let up through 50 years, and will keep right on bringing you the latest in information and ideas on new machine methods for both deep mining and stripping.

What's involved in 50 years of publishing service. In the case of *Coal Age*, when the Golden Anniversary issue is off the press in October, 1,229 issues (weekly and monthly); over 13,000,000 copies printed and mailed, representing over 10,000 tons of paper and ink—and most important of all, 60,100 pages of editorial material. This number of pages, incidentally, would stretch 9½ miles.

In this reporting, this interpretation, this advocacy of useful new ideas in all mining activities, our readers' needs and interests will continue to be our prime concern. We think and plan on the basis of your ideas on what you need to do a better job for the industry and for yourself, and the best we can create will continue to be what we will bring you in the days and years to come.

Your job as a supervisor or manager has grown through the years, and will keep on growing. Consider, for example, the investment in facilities today compared to even 10 years ago—and then look ahead to underground mining units costing \$1 million or more and stripping machines running \$10 million or more. It will take real management skill to make them produce as they should. Yet this is only part of the larger job of keeping costs down and of meeting other major problems.

The job ahead is bigger than ever. But so are the rewards. *Coal Age* is dedicated to helping you attain those rewards in industry and personal progress.

Frank G. Jivon
EDITOR



All The 21 Management Functions

What's involved in managerial and supervisory responsibilities in producing, preparing and marketing coal? As a result of the studies by the *Coal Age* staff—by mail, personal interviews by professional opinion-gatherers and the equally or more-important every-day pulse-taking of the trained and industry-oriented editors, mining, preparation, marketing and related activities seem to break down into 21 functions. They are listed below. Perhaps you will find it interesting and helpful to check the ones in which you are involved.

- | | |
|---|---|
| <input type="checkbox"/> 1. Mining methods | <input type="checkbox"/> 11. Electrification |
| <input type="checkbox"/> 2. Machine—continuous mining | <input type="checkbox"/> 12. Maintenance |
| <input type="checkbox"/> 3. Face preparation | <input type="checkbox"/> 13. Supplies |
| <input type="checkbox"/> 4. Transportation—hoisting | <input type="checkbox"/> 14. Communication |
| <input type="checkbox"/> 5. Roof control | <input type="checkbox"/> 15. Employee—union relations |
| <input type="checkbox"/> 6. Ventilation | <input type="checkbox"/> 16. Safety |
| <input type="checkbox"/> 7. Pumping—drainage | <input type="checkbox"/> 17. Supervisory skill |
| <input type="checkbox"/> 8. Stripping—augering | <input type="checkbox"/> 18. Top management |
| <input type="checkbox"/> 9. Preparation | <input type="checkbox"/> 19. Promoting coal use |
| <input type="checkbox"/> 10. Refuse disposal | <input type="checkbox"/> 20. Better merchandising |
| <input type="checkbox"/> 21. Public relations | |

Gorgas . . . To Banner . . . To R-C

How soon do you think you will have the job of buying and operating a new R-C (remotely controlled) mining unit, or a 100-cu yd or larger strip shovel? And what do you think the problems will be?

As to when, it may be sooner than you think. As to the answers to the problems, some of them should begin to appear this year or next—and *Coal Age* will be on the job to present them. In fact, it started nearly 10 years ago when remote control was first inaugurated on an experimental basis (see articles in December, 1952, and January, 1954).

All this is in line with *Coal Age's* campaign to promote efficiency in coal production, which dates back to the first issue in 1911. In the past 12 months, for example, some 10 major features were devoted to new properties and major modernization programs, starting with Gorgas (strip, deep and auger in Alabama) and going through to Banner, the newest of the Illinois strip mines.

This list is the chart *Coal Age* steers by, mindful always that some things are more critical than others, and mindful, also, that the situation changes from time to time as some things become more urgent and others less. Constant checking in the field to find out what you need and want permits varying the planning to your needs. It serves the equally important function of enabling the editors to look ahead and thus begin to provide information on the things to come. Five of the big jobs *Coal Age* sees ahead for the industry as a result of this field checking, as well as consideration of other pertinent data, are:

1. Getting the labor content of the mine price down to the irreducible minimum—probably around 20 to 25%, compared to the average of 40 to 50% today.

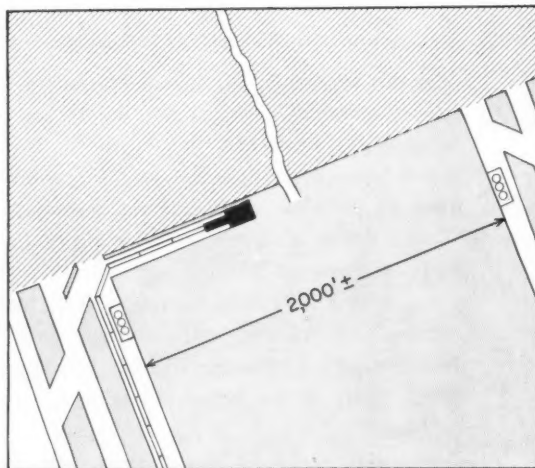
2. Steering the proper course in preparation design to give the customer what he wants, take care of such other matters as stream pollution, and still keep the costs of plant and operation to a minimum.

3. Attaining something approaching the irreducible minimum in safety, involving, among other things, solution of the roof problem—perhaps ultimately by mining systems that will make it unnecessary for men to go under anything but absolutely protected top.

4. Getting closer to the ideal in upping equipment operating time and cutting maintenance cost.

5. Attaining a clear edge over competition not only by lower cost and higher quality but also research, hard-hitting merchandising, cutting mine-to-market transportation costs, and better public relations.

More details on certain key subject groups and on *Coal Age's* future editorial content appear in the material which follows.



The list in the next 12 months will be as long or longer. It already includes what conversion of one old-time shaft to continuous mining meant and how it was done, and what "fourth-generation" equipment is doing for an anthracite producer, plus studies of three new bituminous strippings both large and small.

"Maintenance Ideas"—
A New Service to Coal Men—
Only in *Coal Age*

Computers, Stethoscopes, Grease



Are you having lubrication questions? If you are in the average coal man's shoes you probably are. Recognizing this, *Coal Age* in May will bring you a 16-page special Operating Guide covering briefly and authoritatively the essentials in lubricants, lubricating equipment and lubricating methods.

Though an extra added attraction, this Operating Guide is only one part of a regular month-after-month service set up with the establishment of the Maintenance Ideas section of *Coal Age* in August, 1959. Conducted by an editor who was a specialist in the subject in the industry, this section was the direct outgrowth of rising need for more and better data on the subject reported by coal men themselves.

Computers? They get the answers quick from even a mountain of records. And with the answers—and the proper forms (see for example, February, 1960, for one of a number of groups presented since August, 1959)—real control becomes possible in maintenance.

Stethoscopes? A useful tool in preventive maintenance (July, 1960), warning of possible bearing trouble.

Forks to Factories

How was bituminous coal prepared in the old days? If you look back half a century in *Coal Age* you will find that a lot of it was forked underground to eliminate the fines and picked as it was loaded. Now *Coal Age* features a dozen or more "coal factories" a year in its columns, with additional features treating of certain specific phases of the preparation cycle currently high in interest. Now, the emphasis is on fine-coal treatment and water-handling.

Ahead is an increasing number of completely automated plants where the working force will be one or two operators per shift, plus the necessary maintenance men. With automation also is coming greater simplicity, and new cleaning, drying and handling circuits. Simplicity and new arrangements will be among the features of three new plants scheduled for early study and presentation in *Coal Age*.



Golden Anniversary Issue

October, 1961



The Challenge of Coal's New Growth Era

A half century in the life of any organization is a signal to stop, take a look and consider the future. *Coal Age* will complete 50 years of service to the industry with its October Golden Anniversary Issue. As this happens, it is evident that coal is leaving one era and moving into another as challenging as any in its history, but at the same time offering the possibilities of rewards for managerial skill and know-how on an unparalleled scale.

The signs already are appearing, and in line with its 50-year history of service, *Coal Age* will make its Golden Anniversary Issue a special and comprehensive contribution to management thinking and planning for the coming years of challenge and opportunity. History will be reviewed only to the extent that it will throw light on the things to come, which is where the editorial concentration will be. The issue therefore will treat with, among other things, the following:

Market Growth—Where and how much, including a study of how many people and where they will be, where industry will concentrate and what it will be, what competition—old and new—can and cannot do, coal's growth prospects, and possibilities for new major markets—what and when.

Mining Capacity—How much will be needed, where it will be needed, how much it will cost, and where the money will come from.

Production, Preparation and Safety—What the mines of the future will be using in equipment, materials and methods, and what they will mean in productivity increases, quality improvement and safety.

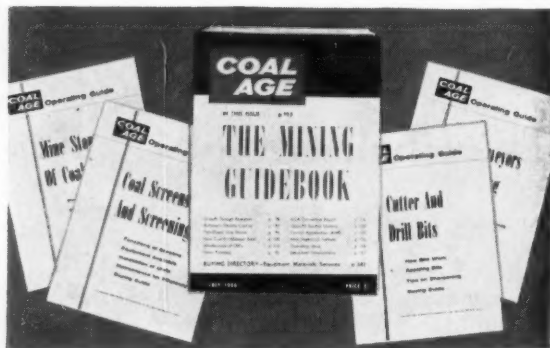
Marketing—Research, promotion and sales in moving tomorrow's coal.

Coal and the Public—Enhancing coal's stature in line with its vital role in the economy.

Manpower—Future needs and sources, building management and worker skill to meet the challenges of tomorrow, attaining the ultimate in cooperative employer-employee relations.

A Program for Progress—Distilled out of the study and research that will go into the editorial content, the *Coal Age* Golden Anniversary contribution will be rounded out with a "Program for Coal Progress"—a step-by-step blueprint of what experience and study show the course of the coal industry should be in cashing in on its opportunities.

Exclusive in Coal Age



The Mining Guidebooks.. The Operating Guides

"I want the latest and best in equipment and methods, but I don't want blue sky in my operation. Production must be based on sound principles of design and operation."

Though some might put it in different words, this is what the editors of *Coal Age* have found to be the basic—and logical—approach of management and supervisors in coal. To meet the need for the fundamentals in addition to the regular news on new developments in methods, materials and equipment, *Coal Age* created the Mining Guidebook in 1955 and in 1959 the Operating Guides, which provide detailed treatment of certain key subjects. Guidebook and Guides bring together in one place the basic principles on which good practice rests and with them a summary of the latest tested developments in equipment and methods. There is no other source of current plus basic data.

COMING UP—The 1961 Mining Guidebook in July and Operating Guides on "Lubrication and Lubricating Equipment" in May, and on "Fine-Coal Treatment and Water-Handling" in December. And more in 1962.



Mine To Market

You have to mine it, you have to prepare it, and finally you have to sell it. This is a thumbnail statement of the ground that management must cover. If you don't

mine as efficiently and prepare as well as your neighbor, you can't sell—or you have to cut the price so you can't make any money. And if you haven't got customers, you haven't got anything. So when you mine and prepare, you have to think about where you can sell—utilities, steel, general industry, abroad, and so on. And if established markets don't give you elbow-room, maybe you need to create new ones to get an immediate payoff or insure profits and prosperity in the farther future. And you have to think if the legislative and public climate is for or against you.

So there's more—much more—to management than just running coal, though even here industrial engineering and skill in dealing with men will pay off. But a knowledge of market trends, of good possibilities for progress through research, of ways and means of doing a better sales job, of problems in the legislative and public-relations fields, etc., etc., are also vital in successful management.

Here, too, *Coal Age* serves regularly and to the point. Example? See Edward G. Fox on "Productivity" in this issue (March, 1961).

Broad Interests . . . Broad Service

Interested in only one thing in mining? If you are, you are very much the exception. Most managers and supervisors have to consider and contend with several mining functions, either directly or indirectly. That is why *Coal Age* rounds out its service with its key departments. For example:

Who's opening a new mine . . . getting a promotion . . . putting up a new coal-burning power plant . . . offering a taxing or a tax-relief bill . . . etc., etc. The *Coal Age* News Roundup brings it to you fast and easy to read.

Want to save walking time for a car-dropper . . . provide a safe unit for changing a big tire . . . protect equipment in cold weather . . . modify a refrigerator for small-parts storage . . . and so on. The Operating Ideas section, exclusively in *Coal Age*, is the department to follow.

Need hints on how to do a better job as a supervisor or manager? That is the every-month function of the Foremen's Forum, exclusively in *Coal Age*.

Interested in what's said at industry meetings on everything from radioisotopes to pulling pillars? *Coal Age* includes full reports of over 20 state and national meetings every year. Next big one: The 1961 Convention of the American Mining Congress; report in June.

What's the latest in excavators . . . continuous miners . . . shuttle cars . . . cutter bits . . . washers . . . screens . . . explosives and detonators . . . lubricants . . . and so on through the entire range of products bought and used by mines. Over 350 of these, carefully selected for their value in mining and related activities, will appear in *Coal Age* New Equipment News in 1961.



DATA PROCESSING SYSTEMS in smaller packages streamline office procedures to match the accelerated pace of operations and engineering. At the same time automatic data paperwork assures minimum overhead.

Modern Office Methods

Electronic data processing, at your office or in regional service centers, reduces costs and provides timely, useful reports. A followup article by the author in a coming issue will describe manual systems of paperwork control.

Dause L. Bibby, President
Remington Rand Division
Sperry Rand Corp., New York

MANY MINE OPERATORS and coal distributors, like their counterparts in other industries, have in recent years allowed an unfortunate paradox to develop within their organization. They have been quick to explore the most modern techniques at the engineering and plant level, yet their office work is still being done on the basis of methods and procedures that date back many years.

The result of this imbalance is a two-fold disadvantage: on the one hand, office overhead costs are apt to be disproportionately high; on the other, management must miss out completely on the broad benefits of enlightened administrative control that only up-to-date paperwork techniques can provide.

The field of modern office technology is a wide one, but for our purposes it can be broken down into two basic areas: one covering manual systems, and the other electro-mechanical or electronic data processing methods. A survey of current manual techniques, some rather complex, some involving little more than a simple visible record system whose margins are signalled to provide a means of graphic control, will be undertaken in a subsequent issue of *Coal Age*. This first article will concern itself with the other side of the story: the kinds of equipment and procedures that constitute what is commonly known as "office automation."

That term may have a frightening sound, suggesting the enormous complexities of a "giant brain" performing incredible feats of statistical analyses in the offices of a billion-dollar corporation, but this image is the result of a widespread popular misconception. True enough, the cost of a large-scale computer like the famous Remington Rand Univac I or II systems runs to well over a million dollars, which does make its installation practical only for companies of major size. Effective paperwork automation, however, is by no means confined to equipment of this class. There are much smaller computers whose principle of operation is the same as the original Univac computer, but whose speed and capacity are more limited (they work with punched cards instead of magnetic tape) and whose cost is relatively quite low.

A major breakthrough in the computer field widened even greater the availability of electronic data processing to all levels of business enterprise—large and small. The new Univac solid-state computer, which in overall performance approximates that of the "big" Univac System though it is priced in the medium range, is the first immediately available computer with operations based on the use of tiny "solid-state" components—transistors and magnetic amplifiers—rather than conventional vacuum tubes. The practical advantage to this elimination of tubes is threefold: the overall bulk of the system is greatly reduced; it can function almost indefinitely without risk of operational breakdown due to circuit failure; and it requires far less power.

The field of modern office technology is a wide one, but for our purposes it can be broken down into two basic areas: one covering manual systems, and the other electro-mechanical or electronic data processing methods. A survey of current manual techniques, some rather complex, some involving little more than a simple visible record system whose margins are signalled to provide a means of graphic control, will be undertaken in a subsequent issue of *Coal Age*. This first article will concern itself with the other side of the story: the kinds of equipment and procedures that constitute what is commonly known as "office automation."

The immediate acceptance of this computer is indicated by the fact that over 75 have already been installed in all types of businesses across the country and abroad—even though the announcement of its availability was made just a little over a year ago.

However, automation in the smaller office need not involve electronic computers at all, but can be achieved through the intelligent use of conventional tabulating equipment. These machines have been in profitable use in all kinds of business for more than 50 yr.

Nor, is it necessary any longer to buy or even rent data-processing equipment in order to enjoy its benefits. The establishment of Univac service centers throughout the nation has put the entire range of contemporary data processing equipment, from simple tabulating machines to the large-scale Univac systems, well within the economic reach of the small office.

Raw facts concerning day-to-day business activity, data to serve as the basis for automatic cost accounting, payroll preparation, inventory control, etc., is collected and sent to the service center at regular intervals. The necessary processing is then performed on whatever type of equipment best suits its requirements, and the results are promptly returned to the customer. The fee for the service is based on actual machine time utilized.

These service centers are equipped to receive the information they process in any form. They can work from figures scribbled on scratch paper, if necessary, but many companies have found it advantageous to furnish the raw data in a form that will enable the machines to go to work on it as promptly and inexpensively as possible.

One such company, a wholesaler employing 25 people, uses a Synchro-Tape typewriter to write out its daily customer invoices. The machine automatically creates a punched-paper tape containing the necessary information on every invoice typed. The tape is sent to the service center, where a second machine automatically translates the data into punched-card form.

The cards are then used for a rapid series of mechanical or electronic procedures that result in the printing of a comprehensive sales analysis ready to be delivered to the company the following morning. In this report the previous day's sales activity can be combined with month to date and

year to date figures in such a way as to provide an accurate survey of the current sales picture in terms of customers, product class, and cost.

Daily production figures, payroll data and other accounting and statistical information can be gathered and taped for processing in the same way for any company. The tape can also serve to activate a wire communications system, automatically conveying the figures to a computer station that may be located many miles away—and can receive and type out the answers by a reverse flow of the same procedure. This is because the tape is similar to that used in wire communications systems, such as telegraphy.

In many other small firms, the installation of only a few basic pieces of punched-card equipment can effect economies and benefits that plainly justify their cost. One small eastern machine shop, for example, recently reported that the installation of three low-cost punched-card units, a punch, a sorter and a tabulator, has provided management with the kind of tight, effective cost accounting that is normally associated only with large firms.

The shop, which employs some 300 people, must control its costs on a job basis, a procedure involving accurate recordkeeping on man-hour costs during the working day. A recent period of rapid business expansion left its conventional costing method inadequate to the demands of the stepped-up task. The standard job ticket still told management how long a man had worked on a given job, and his hourly pay rate, but it could not provide any further information, such as the correlation of straight time and overtime on a per-job basis. Weekly and monthly cost accounting reports were similarly limited in scope, and more often than not such facts as were obtainable would arrive on management's desk too late for effective action.

The use of the three-unit punched-card system, which requires only one person to operate, has changed the situation. The firm can now get a complete report on the progress of any given job in one hour, enabling them to check against an original estimate to see how they're coming along. If the figures show that costs are out of line, there is still time to do something about it.

Furthermore, there is no difficulty in providing a regular analysis by employee, whether on a particular job

or on all his work, or by department. Overtime costs can be pinpointed right down to the minute and the penny. By the same token, they can pinpoint plant machine efficiency to bring attention to those units which are not sufficiently productive to justify continued use.

With these exact operating figures, from direct labor costs to plant machine efficiency, the company can realistically set prices for optimum benefit of itself and its customers, and can prepare necessary government reports with a minimum of clerical effort, all from the work of three low-cost machines handled by one operator.

When a small-scale electronic computer is added to a tabulating installation, it opens new horizons in management's ability to gain insights into the facts of daily business activity. Punched-card computers such as the Univac 60 and Univac 120 are designed to handle any conceivable problem that can logically be broken down into a series of mathematical steps, and to do so at electronic speed, with self-checking accuracy.

Rapid Processing

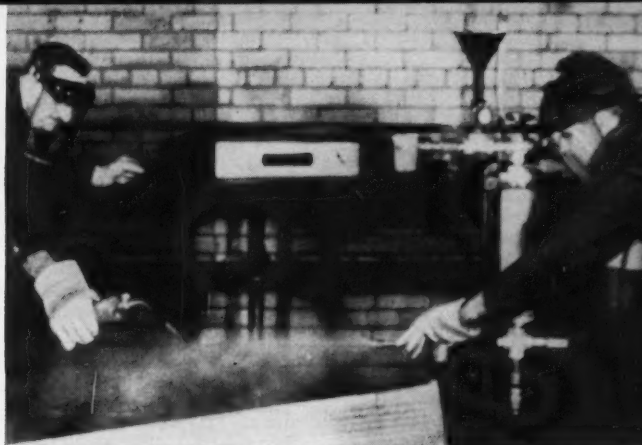
One typical punched-card computer user, a wholesaler in Boston, has developed a system that would seem to be readily adaptable in principle to the equipment-inventory control problems of a mining operation, as well as control of coal distribution.

Exploiting the speed, capacity and elementary logic of a Univac 60 computer, this company has programmed the equipment to compare figures representing new inventory balances, with the pre-established re-order point on each of its more than 25,000 inventory items, and to automatically issue record instruction whenever necessary.

In this successful and fully automatic control system, the computer maintains an updated master inventory file in the form of punched-card information, a file showing on-hand and on-order amounts as well as quarterly sales records for each item. In addition, as each master inventory card contains the unit cost figure of the recorded item, the entire inventory can be immediately evaluated at any time by a simple automatic extension of unit costs and on-hand amounts.



Conventional hydraulic fluid burns fiercely when sprayed into flame.



Shell 3XF hydraulic fluid does not burn in identical test. It's safe.

PHOTOS COURTESY U.S. BUREAU OF MINES

BULLETIN:

Shell Research forces water into oil to produce an economical, fire-resistant hydraulic fluid for mines

Hydraulic mine machinery is run by electricity. A short circuit can start a fire. The flames can melt a hydraulic hose and feed on a conventional fluid.

New Shell 3XF® Mine Fluid, mixed with water, reduces this risk. It is an economical, water-in-oil emulsion that resists fire.

Read how this product of Shell Research became the first fire-resistant hydraulic fluid to be approved by the U.S. Bureau of Mines under Schedule 30.

WITH THE invention of Shell 3XF Mine Fluid, the danger of underground mine fires can be greatly reduced.

Here is the story of how Shell scientists developed this remarkable product:

Mineral oil, they knew, is an excellent hydraulic fluid. But it burns. Water is an excellent fire extinguisher, but not the best lubricant.

Why not find a way to combine the two? Oil for lubrication, water for safety. No simple task. But Shell Research did it.

They did it by perfecting a unique kind of water-in-oil emulsion. The water was literally forced into the oil—making a stable, emulsion-type hydraulic fluid.

The oil lubricates. The water provides all-important protection against fire.

How it was proved

Exhaustive tests of 3XF hydraulic fluid proved its effectiveness—under fire. One of those tests is pictured above.

Even when sprayed into a flame, 3XF hydraulic fluid would not create a fire hazard.

However, safety alone was not enough. 3XF hydraulic fluid also had to work in existing mining machinery. And it would be most desirable if it could be compounded *at the mine*.

Add water and use

So, Shell Research developed a special concentrate called 3XF Mine Fluid.

Add 40% drinking water to 60% concentrate—mix, and the product is ready for use.

Mines evaluated the performance of Shell fluid in hydraulically operated equipment. Twenty-five decided to use it.

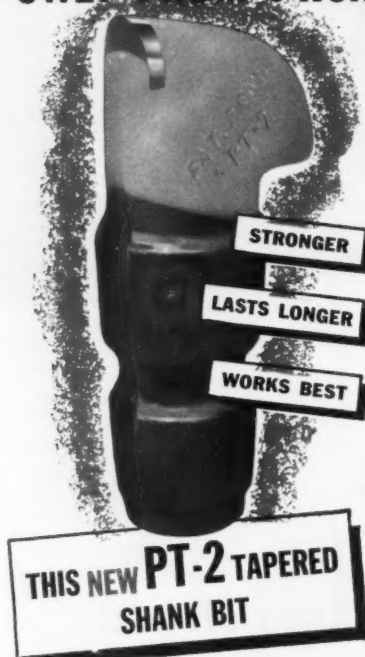
On February 18, 1960, Shell 3XF Mine Fluid ushered in a new era of mine safety when it became the first fluid approved under U.S. Bureau of Mines Schedule 30.

For complete data about 3XF Mine Fluid, contact your Shell Industrial Products Representative. Or write: Shell Oil Company, 50 West 50th St., New York 20, N.Y.



A BULLETIN FROM SHELL
— where 1,997 scientists are working to
provide better products for industry.

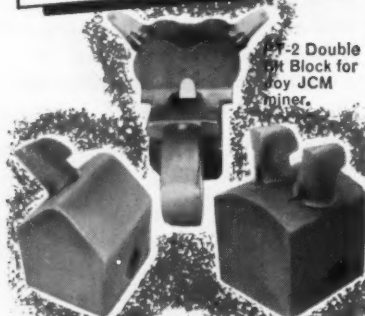
ONLY FROM PROX



Ends down-time due to failure of set screws, roll pins, rubber retainers, or broken shanks. Results in less inventory, less maintenance.

Round shank exceeds 3 times the back-up area of conventional bits. Incorporates improved aligning—assures perfect match between holder and bit—is easily removed from top or bottom. You get less distortion; positive bit-angle maintained; quicker, more accurate setting; no bit vibration; longer life for carbide.

Bit-Lug designed for
QUICK-CHANGE PT-2
—saves \$\$\$\$



PT-2 Single Lug for Joy Pineapple on JCM machines.

PT-2 Double Lug for Joy Pineapple on JCM machines.

Investigate the complete line of Prox cutting equipment.

PROX

FRANK PROX COMPANY, INC.
TERRE HAUTE, INDIANA

Write for the name of your nearest Prox Sales Representative for complete information.

In its automatic re-ordering procedure, the computer first arrives at a net figure for each item by adding receipts, returns, and previous on-hand figures, then subtracting sales or removals from stock. It gets the new-order figure by subtracting receipts from the previous on-order record. The net on hand and new order figure are added to produce a total commitment amount.

If this proves to be lower than the order point, it calculates the optimum order quantity by subtracting the total commitment figure from a maximum control figure (which represents the time required to place and ship the order, place the receipts in stock, and perform invoice processing, based on past experience for each inventory item). If the total commitment amount turns out to be greater than the order point, a new updated inventory card is automatically produced.

The entire inventory processing is undertaken once a week. There is still ample time left on the equipment to permit its use for automatic customer billing, sales analysis, and other data processing routines.

The "big" Univac computer itself—the system that has successfully predicted Presidential elections and mathematically tracked down lost asteroids in space—offers the ultimate in paperwork automation to any company whose record requirements are voluminous enough to keep it busy. One major eastern manufacturer has installed such a computer to provide what may well be the most comprehensive inventory control program yet developed in American industry.

In principle, this inventory system is much like the procedure outlined above. The difference is that the whole operation is on a much larger scale, and that the element of human intervention between the separate procedural steps has been virtually eliminated.

Automatically managing a vast inventory of both replacement parts and raw stock, it decides when to re-order any given part, how many to order, and automatically prints the necessary purchase requisitions, complete with receiving and routing instructions. It examines the company's position on each requisition, weighing stock on hand against the known usage rate and procurement lead time.

If the facts warrant, it automatically prints "Rush" on the papers.

What's more, the computer prints

a weekly "Catalog of Standard Parts and Hardware" itemizing costs, stocks on hand and on order; a separate report giving the current status of parts on order; and an inventory verification report. It also produces a report on overdue purchase orders, and an accounting for inventory movement through vouchers for the company's monthly accounting journal. With a system of this capacity, there is virtually no limit to the degree of office automation that can be profitably achieved.

Owing to the wide range of computing equipment now available, it has become the practice in many modern business organizations to go into automation a step at a time as their volume increases—starting, perhaps, with a straight tabulating setup, graduating to the installation of a punched-card computer, and then moving into more sophisticated data processing.

Higher Capacity

An interesting case in point is provided by a New Jersey organization. They began with a conventional punched-card machine. In the early "Fifties," they installed two Univac punched-card computers to handle what was then an unprecedented volume of daily paperwork. Within the next 5 yr the workload had increased sufficiently to warrant the installation of two additional systems of the same class.

Last year, with volume still on the upgrade, the company exchanged all four of its punched-card computers for the solid-state computer.

In this particular application, the amount of work that formerly required the full-time use of all four punched-card computers is now being comfortably handled in only 60% of the solid-state system's capacity. Its users have estimated that it may be as much as 10 yr before they will again have to think in terms of expanding their data processing facilities—and in the meantime, from a fiscal standpoint, the new system has already begun paying for itself.

New developments are constantly occurring in the technology of clerical automation—both in the exploring of new applications and in the design of new electronic equipment. It's a field in which today's astonishing achievement is tomorrow's standard practice; no one can predict how far the frontiers of automation will be extended in the next few years.



"A drop in the bucket!" The constructions shown here by Tom Weichel, Okonite's chief mining engineer, are just a random sampling of the cables that Okonite has developed for mining operations. More

than likely, Okonite has available right now the exact cable you need—in terms of toughness, flexibility, capacity, resistance to oils, acids, alkalies, mine water and high heat. If not . . . we know how to build it!

Here's how we add value to your cable dollar

Behind these cable constructions are service records that prove the extra long life of Okocord portable cables in the face of continual high-speed reeling, rock falls, run-overs and constant dragging over mine floors and around sharp corners.

Longer cable life means lower operating costs . . . reduction of costly work stoppages . . . greater utilization of expensive equipment. Truly, Okocord represents money in the pocket for any mine operator.

Here's how Okonite Cable'bility assures maximum value for your cable dollar:*

1. By the use of materials developed in more than 80 years of making the finest cables.
2. By constant research to find even better materials and constructions.
3. By intimate, first-hand knowledge of mining problems and conditions.
4. By self-imposed standards for manufacturing and testing that are more exacting than the industry requires.

There is an Okonite quality cable for your shovels, drills, shuttle cars, continuous miners and other equipment. There are Okonite specialists ready and willing to help you in the planning or installation stages. And there is a booklet full of valuable hints on picking the right cable constructions for your all-important power or control circuits. Write for free Bulletin CA -1117—"How to choose insulated cable"—to The Okonite Co., Subsidiary of Kennecott Copper Corp., Passaic, N. J.

*OKONITE Cable'bility . . . cable craftsmanship since 1878



where there's electrical power . . . there's **OKONITE CABLE**

Foremen's Forum

Character of an Executive

The successful executive is one who has developed the positive traits of character and who consciously strives to suppress the negative quirks. Here are parallel lists of positives and negatives.

ONE of the more interesting paperbacks to cross your correspondent's desk recently is entitled *Line Management*, prepared by the staff of Pierce Management, Inc., Scranton, Pa., the well known consulting firm. Some quotations from the chapter on executive selection are set forth as the text for this month's piece on these pages. *Line Management* says:

" . . . Executive traits which can

be cultivated and the use of which are required daily by the executive are: Self-control, friendliness, kindness, courtesy, enthusiasm, calmness, unselfishness, consistency, simplicity, frankness, firmness, dignity, patience, self-reliance and ingenuity.

"Some undesirable human weaknesses which the executive must school himself to avoid are: Coldness, favoritism, nag-

ging, snooping, abruptness, snobbery, cruelty, mockery, teasing, impatience, stinginess, sarcasm, jealousy, indecision and greed."

Place these lists side-by-side, and let's ponder the meanings of the words as they might be characteristic of the man who aspires to lead a project or enterprise.

It looks like this:

Develop these . . .

1. Self-Control—The evident measure of genuine self-discipline is demonstrated self-control. An even-tempered reaction to problems as well as to praise is the mark of a sure-footed boss.

2. Friendliness—An outgoing nature triggers a favorable response from others. Friendliness improves communications.

3. Kindness—In a supervisory sense, kindness may be defined as deep concern for the fullest possible development of others as well as one's self. The truly good executive is a builder of enterprises and people.

4. Courtesy—It costs nothing. It lubricates the conduct of meaningful work. The company image, good or bad, is created largely through executive courtesy—or the lack of it.

5. Enthusiasm—The company that is led by a highly-motivated chief moves upward and grows. The happy truth is that enthusiasm is infectious.

6. Calmness—This springs from inner reserves of knowledge, ability and purpose. Real executive calmness is evident only at times of crisis or stress.

7. Unselfishness—A willingness to give credit where credit is due—to superiors, colleagues and subordinates with equal grace—is one of the more desirable traits in a leader.

8. Consistency—Establish reasonable policy for the conduct of affairs, then apply the policy the same way in

Suppress these . . .

1. Coldness—Sometimes coldness is a defense employed to mask uncertainty, especially by newly-promoted people. The need is to make certain that reasonable caution does not become aloofness.

2. Favoritism—We deplore nepotism in politics. Amen.

3. Nagging—The mind of the one who is nagged wanders from his work. He spends his time devising schemes to avoid the nagging. Then more nagging becomes necessary if the appointed quota of work is to be done.

4. Snooping—A big boss will suffer pangs of embarrassment if he catches himself snooping. When he lays out work to be done he "follows through," he doesn't have to snoop.

5. Abruptness—Failure to give full hearing to a suggestion or a complaint obviously will abort a possible money-making idea or raise a full-blown grievance. Easy does it when people want to talk.

6. Snobbery—Today's executives and supervisors are chosen more for ability than looks. Responsibility is a sobering, humbling influence, so why get uppity?

7. Cruelty—The selection process should eliminate sadists. Supervisory cruelty wastes human resources by creating high turnover. No valuable employee takes an excess of guff.

8. Mockery—Have you ever worked for a boss who made personal cracks, especially about physical handicaps of others. What did you think of him? Where is he now?



YOU CAN KEEP THIS END BIT ON THE BLADE 2 TO 3 TIMES LONGER

Our Simplex Dipper Teeth proved so successful that we decided to make end bits out of the same material. (It's Amsco "CS"—a specially heat treated alloy steel.)

Dozing in dirt, sand or rock, operators say our end bits are lasting 2 to 3 times longer than bits made of other materials. They hold a sharp edge until completely worn out—not just partly worn. And they're very tough to bend or break.

Suggestion: First chance you get, order a set of Amsco End Bits from the nearest Amsco Dealer. If you don't know who he is, write us, and we'll send you his address plus a copy of the Amsco End Bit Buyer's Guide.

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FOR
THIS
END
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American Manganese Steel Division • Chicago Heights, Ill.
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St. Louis. In Canada: Joliette Steel and Manitoba Steel Foundry Divisions

Do's for Executives...

similar situations. But be ready to amend policy when good judgment prompts a change.

9. Simplicity—The art of giving directions that are followed through to successful results is based upon describing the job, explaining the reasons for it and defining the goals in clear, uncluttered terms.

10. Frankness—Saying "No," when such is called for, in perfect honesty, directness and clarity is the soul of frankness. But frankness is not brusqueness.

11. Firmness—Tenacity goes hand-in-hand with firmness. The accomplished executive or supervisor studies alternatives before he decides upon a course of action, thus justifying his firmness.

12. Dignity—Self-possession, self-esteem and humility are the ingredients.

13. Patience—The mature chief knows that he must teach, and perhaps teach the same lesson again—and again—without losing his equanimity. Patience is a virtue.

14. Self-Reliance—The action within an executive's sphere of influence originates within himself, finally. The good executive provides his own impetus and much of his own criticism.

15. Ingenuity—This trait is indispensable if the executive is to move his enterprise forward through a myriad of opposing or obstructing influences. It is compounded of intuition, knowledge and timely action.

Our chapter in Pierce Management's tract closes with this:

"We have not mentioned education and technical training. Nearly all positions in industry today require a special background of education and practical experience. This training, however, does not make an executive; rather, it makes a technician whose ability to get results, if

he has not developed executive traits, is limited almost entirely to his own individual efforts."

Some go through life oblivious of the fact that executive ability can be developed, that executive development consists of personality development as well as technical knowledge and skill. Some of these folks actually want to be execu-

... and Don'ts ...

9. Teasing—It may be fun, but it is patently unfair if the boss does it since the target of the badinage cannot really answer in kind. Know your people, tease with care and be big enough to take in good humor whatever comes back.

10. Impatience—Lack of composure and intolerance of interruptions that result from human shortcomings will never weld a trained, productive team. Part of your pay is for patience.

11. Stinginess—Thrift and conservation are not bad words; stinginess is. A company will not prosper unless money is spent, wisely and well. It is also possible to be stingy with deserved praise and criticism to the detriment of the job.

12. Sarcasm—In its Latin roots sarcasm means "to tear flesh like dogs." Naturally, the term S-O-B was coined to describe sarcastic people.

13. Jealousy—More to be pitied than censored is the High Mogul who resents the successes and achievements of others. The respected chief is never petty.

14. Indecision—Swan dive or belly-womper? Many a kid walks off the diving board because he doesn't know in advance which of these results his efforts will produce. Morbid fear of the consequences of action underlies indecision.

15. Greed—This is one of the seven deadly sins. It is particularly unpleasant when the greed of the boss leads him to usurp credit. It inhibits the full development of executive or supervisory skills.

utives. They delude themselves in thinking that the mantle of leadership is conferred, not earned.

Be assured, therefore, that the foregoing lists of positives and negatives in executive personality are not mere platitudes. The positives are marks of useful executives; the negatives describe the mediocre ones.

Remarkable Rise

THE 26-YR-OLD young man had recently been promoted to the presidency of one of the biggest "blue chip" companies. His appointment was so startling that one of the weekly news magazines sent a reporter to get the story.

The reporter asked, "Do you attribute your rise to a varied background of experience?"

"No," the new president replied, "before I joined this company I was a PFC in the Army."

"Well, then, are you a major stockholder in the company?"

"No, I don't own a nickel's worth of stock in this company or any other."

"Have your family connections favored this appointment?"

"No, I'm not related to anyone in the company, but I'll tell you—I've had the most amazing luck ever since someone stepped on my IBM card with a golf shoe."

Which are you?

When production begins to wilt and

product quality falls off. . .

When grumbling increases and people snap at each other. . .

When a formerly smooth operation becomes a knotty tangle. . .

Which are you—part of the problem or part of the solution?

If you are not already neck-deep in water underground or knee deep in mud in the surface mines, take steps now to handle the floodlike water runoff that could follow a quick thaw after a snowy, cold winter.



Photographed on the job with Pioneer Construction Co. at Treverton, Pennsylvania

Pioneer Construction Tests All Major Wire Ropes — Picks Yellow Strand “POWERSTEEL” and Flattened Strand

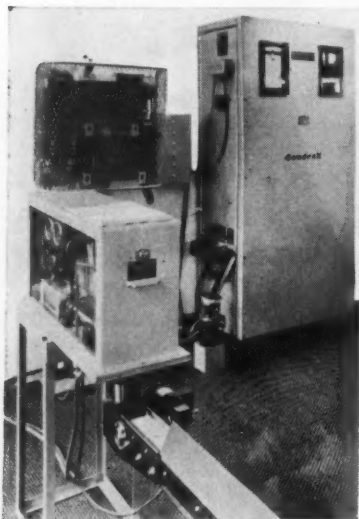
The test that proves Yellow Strand best is **comparison**. For over-burden removal at coal stripping job on Treverton Mountain, Pioneer Construction Co. of Shamokin, Pa. made its own test. Flattened Strand on the hoist and “POWERSTEEL” on the drag line were pitted against other premium ropes. Result? —

longer operating hours with Yellow Strand. Put “POWERSTEEL” or Flattened Strand to your test. In the long run, greater strength, extra durability and more resistance to corrosion and damage make these wire ropes **best** for economy. Contact your Yellow Strand distributor or write direct for full particulars.

Yellow Strand
“POWERSTEEL”

BRODERICK & BASCOM ROPE CO.
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Operating Ideas



Continuous Automatic Ash Determination

CONTINUOUS ANALYSIS of raw- or clean-coal ash is reported to be possible with apparatus developed by the Netherlands State Mines in cooperation with N. V. Nederlandse Röntgenapparatenfabriek Evershed-Enraf of Delft.

The system can be installed directly at the washing operation. As raw coal flows to the washing plant it is continually sampled in the first of three functions performed by the tester. The samples pass into a conditioning section where they are dried, ground and fed onto a rotary disc.

In one continuous operation the ground coal is exposed to X-rays, which

are immediately reflected and measured photoelectrically. Coincidentally, this measurement is compared with that of a reference sample and the results are recorded on a tape. At the same time, a meter calibrated for ash content indicates the percentage. This meter can be connected to an automatic control to interrupt the washing process if the quality of coal falls below standard.

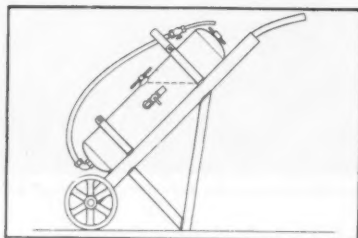
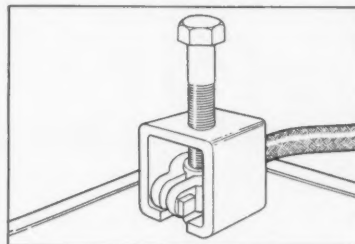
A further application is at the outflow end of the plant where constant analysis of clean coal can be conducted and recorded. The printed tape is available for inspection not only by the producer but also by his customers.

Puller Saves Time

A PULLER for battery terminal lugs saves time and possible damage to terminals, according to *Fleet Owner*, another McGraw-Hill publication. When the puller that came with the kit of battery tools in your shop is misplaced, replace it with one made from a piece of strap iron $1\frac{1}{4}$ in wide by at least $\frac{3}{8}$ in thick.

Bend the strap to a U-shape as shown and then bend claws at the open end to provide grips for the terminal lugs. Drill and tap the center section for a $\frac{3}{8}$ - to $\frac{1}{2}$ -in bolt.

To use the puller, slip the claws over the terminal lug and tighten the bolt. The bolt pushes down on the terminal and lifts the lug without damaging the battery.



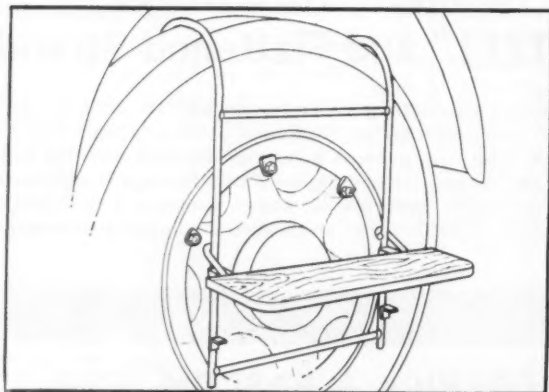
Portable Oil Cart

A SHOP-MADE oil cart is handy for carrying transmission, engine or differential lube for use in the shop or yard area. It is especially handy for topping up trailer hubs with wheel oil seals, reports *Fleet Owner*.

Make it from a large-size trailer air

tank strapped to an angle-iron frame. Attach two hand-truck wheels to an axle made from bar stock and welded to the frame.

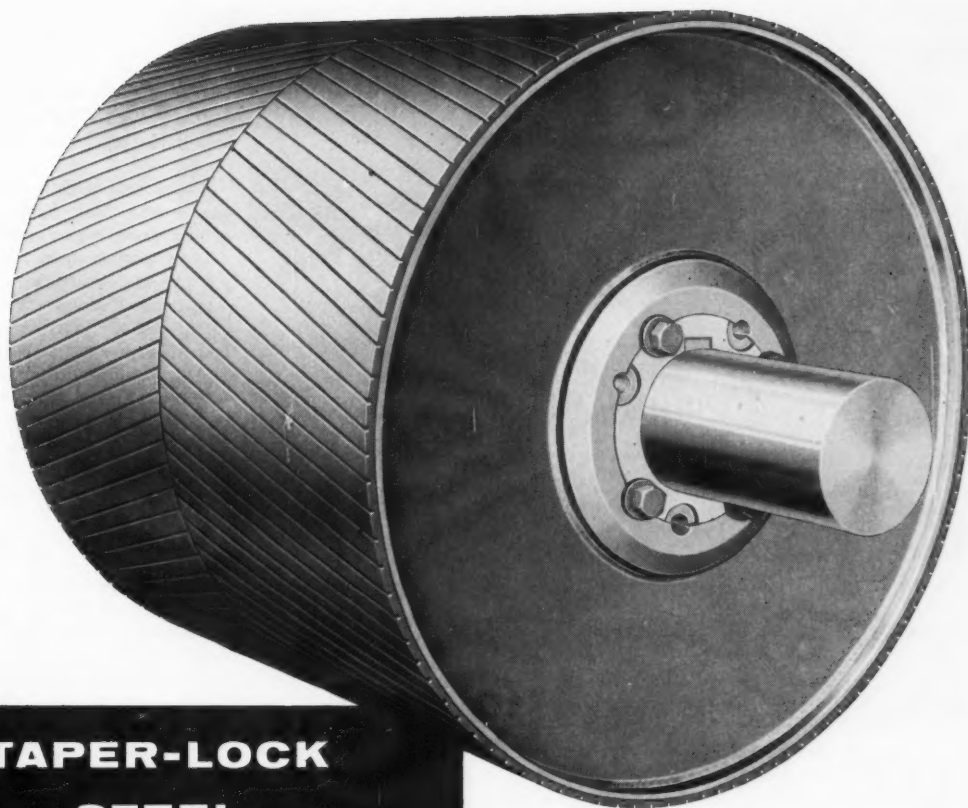
The opening at the bottom connects to a $\frac{3}{8}$ -in brake-chamber air hose with valve and nozzle. The side opening mounts a shop-type quick-disconnect air valve. The front opening is kept uncovered to check the level during filling.



Wheel Step Eases Engine Maintenance

A WHEEL STEP makes it easy to reach into engine compartments even when vehicles are parked close together, according to a recent issue of *Fleet Owner*. The step fits wheels for tire sizes from 11.00x24 down to 9.00x20.

It is made from scrap $\frac{1}{2}$ -in. angle iron and a step board. Bend two pieces of pipe to fit the tire and weld on two cross pieces as shown. Two $\frac{1}{2}$ x1 $\frac{1}{2}$ x8-in angle irons support the step. Round steel stock, $\frac{1}{2}$ x7 in, is bent to hold the step at an 80-deg angle. Three supports welded to the frame provide 16 in of height adjustment.



TAPER-LOCK STEEL CONVEYOR PULLEYS

Maximum strength with minimum weight...

Unmatched holding power on the shaft...

New mounting simplicity.

The rims, discs and hubs of these modern conveyor pulleys are *steel*—and they are fused together into jointless drum construction for (1) maximum strength with minimum weight, (2) exclusion of dirt, water, steam, (3) terrific shock resistance.

With the patented Dodge Back-up Bar, welds of full rim thickness are achieved—and the ultimate in strength is assured by submerged arc process welds.

Taper-Lock Steel Conveyor Pulleys *hold*. Taper-Lock provides the equivalent of a shrunk-on fit—there is no "walking" on the shaft. Mounting and demounting are simple. Pulley and bushings mount as a unit. Alignment is easy. And the tapered bushing is wedged into place merely by turning the mounting screws. It is "unlocked" by using the mounting screws as jack screws.

Available in diameters from 6 inches to 8 feet—all face widths. Standard or special rubber lagging available. Ask your local Dodge Distributor—or write us for bulletin.

DODGE MANUFACTURING CORPORATION, 3000 Union, Mishawaka, Ind.



97 Taper-Lock Steel Conveyor Pulleys are used in this famous conveyor system engineered, manufactured and erected by Hewitt-Robins, Inc., at the Southern Pacific's causeway construction across the Great Salt Lake.

DODGE

of Mishawaka, Ind.



CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look under "Dodge Transmissioneer" in the white pages of your telephone directory, or in the yellow pages under "Power Transmission Equipment."

Operating Ideas (Continued)



Proper Track Tension Boosts Output

YOU CAN get more work out of your crawler tractors by maintaining the proper track tension. Improper adjustment also can result in costly repair bills if neglected, warns the service department of International Harvester Co.'s Construction Division.

While loose chains predominate in

track trouble, tight chains frequently cause trouble and are as harmful as loose ones. For instance, crawlers with very tight tracks barely can move in the higher gears. It has been estimated that tight tracks can waste as much as 90% of the engine's power. Tight chains pre-load the front recoil mechanism, causing

the track pins and the bushings to bind.

Chains only slightly tight also can be troublesome. Many servicemen asked to correct poor engine performance have found improper chain adjustment.

There are two reasons for tight tracks—inaccurate adjustments or operating conditions. Certain types of fine soil will pack between the pins and bushings, resulting in loss of slack in the assembly.

To remedy this condition, it is necessary to adjust the chains until they are loose enough to obtain normal clearance. When operating a tractor in soil that packs, it is important to check the adjustment frequently.

When chains are too loose, the track has a tendency to come off when the crawler pivots, operates on side slopes or backs up an incline. An operator may concentrate so intently on keeping the track in place that his production decreases materially. Even if a track is not loose enough to come off it may deflect to the side, causing abnormal wear on roller flanges, sprocket teeth and the sides of links. Loose chains also have a nasty habit of whipping at high tractor speeds. This motion creates severe impact on all running gear parts.



Plastic Pipe Cuts Installation Costs

USE of a new-type of polyethylene pipe at the Tralee, W. Va., mine of Allied Chemical's Semet-Solvay Div. has resulted in a substantial saving in installation time and material cost, according to company mining engineers.

To date, 21,000 ft of 2-in polyethylene pipe have been installed for air and water lines. A study shows economies over metal pipe of 5½% in material costs.

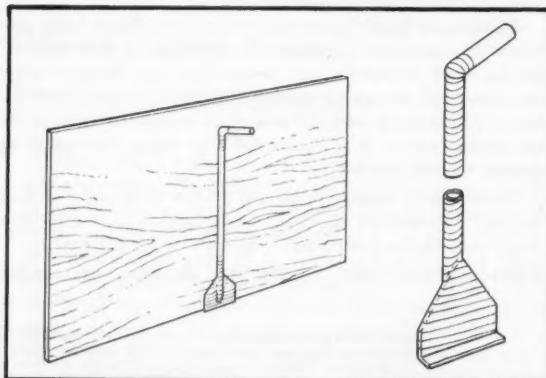
Mining officials have found the flexibility and continuous lengths of the Orangeburg SP polyethylene pipe to be particularly helpful to workmen when installing pipe in low-height areas.

A more recent use of the pipe is for emergency fire fighting because it can be installed in a minimum of time.

Lift Eases Panel Carrying

THIS SIMPLE TOOL, described in a recent issue of *Fleet Owner*, makes it easy for one man to pick up and carry a large sheet of metal, plywood, plastic or glass without damaging it.

It can be made by welding a 20-in length of ½-in pipe to a flange bent to form a carrying trough. A handle can be made by bending the pipe or by welding an L-shaped piece to it. In either case, make sure that the handle turns out from the carrying trough so that there will be room to grip it without trapping your hand against the panel being carried. If you want to carry finished surfaces, tape the flange and handle with tape to prevent scratching.

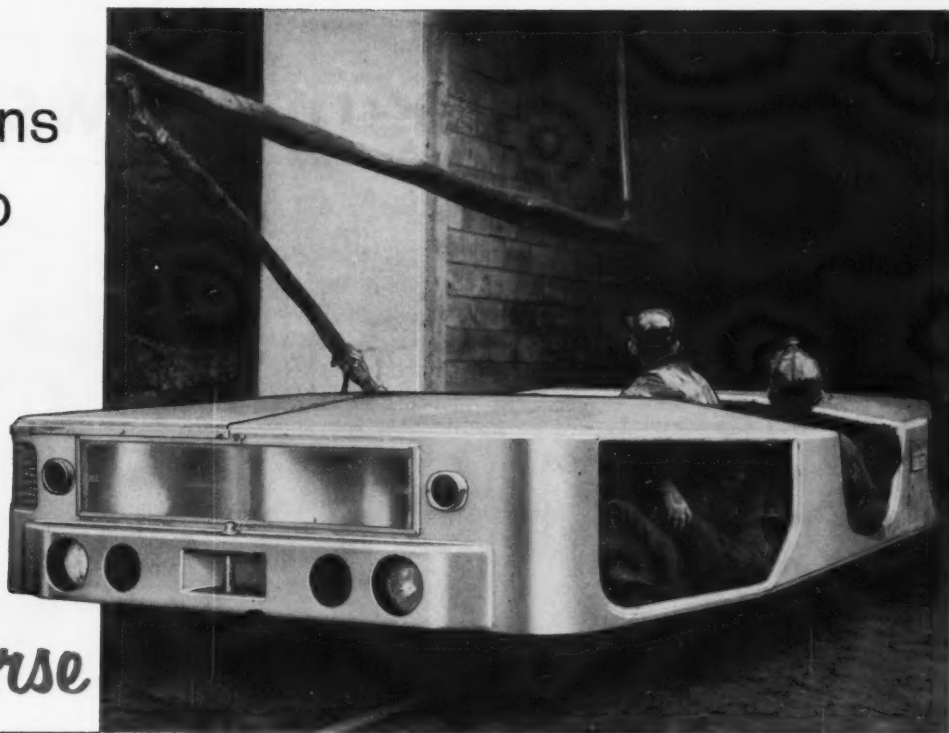


Reasons
why so
many
mines
use
the

Lee-Norse

LOW

mine portal bus



- ① **FAST**—Cuts portal to portal time as much as 50%.
- ② **STREAMLINED**—Transports 11 to 13 men in safety and comfort in low seams.
- ③ **SAFETY**—Exclusive split-roof allows operator full directional vision—trolley pole easily reached. Quick acting hydraulic truck-type brakes on each axle and on the traction gearmotor. Independent mechanical hand parking brake each axle.
- ④ **POWERFUL**—Self-propelled by sturdy traction-type 15 HP gearmotor (250 or 550V—DC).
- ⑤ **RUGGED**—Quality built to withstand the hard usage of 'round the clock mining!
- ⑥ **LOW MAINTENANCE**—Simple design—easy accessibility.
- ⑦ **OPTIONAL FEATURE**—Electric dynamic brakes for plus safety on severe grades.



Lee-Norse Company

CHARLEROI, PENNSYLVANIA

Specialists in Coal Mining Equipment

New Equipment News

420-Hp Diesel

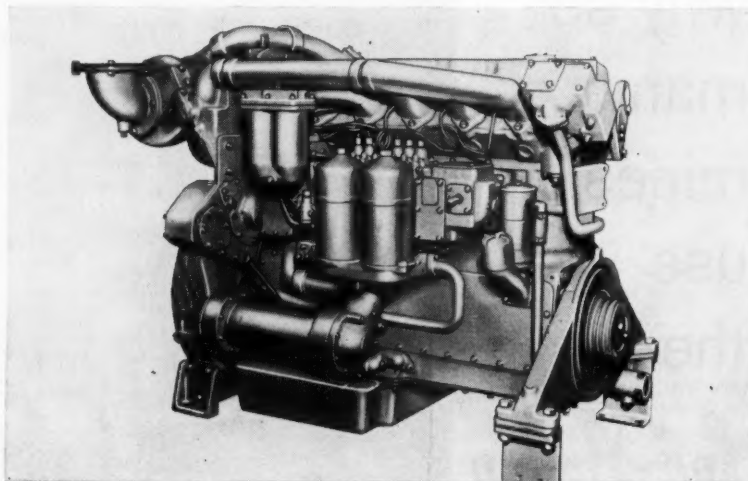
Built to power 2½- to 4½-cu yd excavators and 30- to 50-ton locomotives, the Cat D343 Series A diesel engine is now offered all segments of the mining industry by the Engine Div., Caterpillar Tractor Co., Peoria, Ill.

The D343 Series A is a 6-cyl, twin-overhead-camshaft diesel with a 5.4-in bore, 6.5-in stroke and 893-cu in displacement. It is available turbocharged, or turbocharged and aftercooled, for more power. The turbocharged and aftercooled industrial engine develops 420 hp (maximum) from a package 72.4 in long, 40.3 in wide, and 51.8 in high. Turbocharged, it is rated at 360 hp maximum.

The electric-set version of the turbocharged and aftercooled D343 produces 200 kw continuous and 250 kw for standby operation; turbocharged, 175 kw continuous and 200 kw standby. This electric set uses the new Caterpillar static-regulated, static-excited generator.

One great advantage of the Cat D343, cited by the manufacturer, is its 4-cycle design, providing a longer period for complete efficient elimination of all exhaust gases through full exhaust strokes. A power-consuming mechanical blower is not required for scavenging. Intake strokes provide a full charge of clean, fresh air for the next power stroke.

Using a precombustion chamber fuel



system this Cat diesel is described as able to burn efficiently a wide variety of diesel fuels ranging from premium diesel fuels to furnace oil. A great saving is said to be realized when comparing the Btu content of the lower-cost, high-energy fuels with the Btu content of higher-cost low-Btu premium fuels. Through use of the precombustion chamber, more work per gallon can be produced with the lower cost fuels.

Through the use of a turbocharger, Caterpillar notes, energy from the exhaust gases is used to compress more air

into the cylinders. Thus more fuel can be burned efficiently, resulting in greater horsepower output. By using an aftercooler the compressed air coming from the turbocharger is cooled, increasing its density. Greater power can be taken from the engine.

A dry-type air cleaner of over 99% efficiency is standard on the D343, as is an engine oil cooler connected in series with the jacket water system. It holds the oil temperature to an ideal range as high temperatures tend to break down the lubricating qualities of the oil.



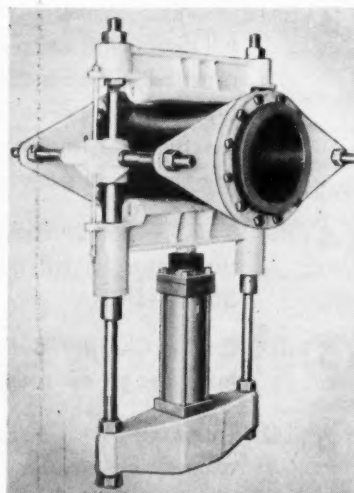
Low-Profile Trucks

The C-line of light-duty trucks offered by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., feature a "low-profile" with overall-height reductions of from 3 to 5 in, new exterior styling, longer wheelbases and a choice of new suspension systems and frames. Models range from 4,200 to 8,800 gvw. Standard (photo) and Bonus-Load pickup, panel, Travelall (9-seater station wagon) and Travelette (combination 6-

man cab with pickup body) models are offered, as are chassis with stake, platform, dump and service-utility bodies. C-line includes 2- and 4-wheel-drive chassis and International V-8 engines. Both independent torsion-bar or I-beam front-suspension systems and welded-box-section or channel-steel frames are optional.

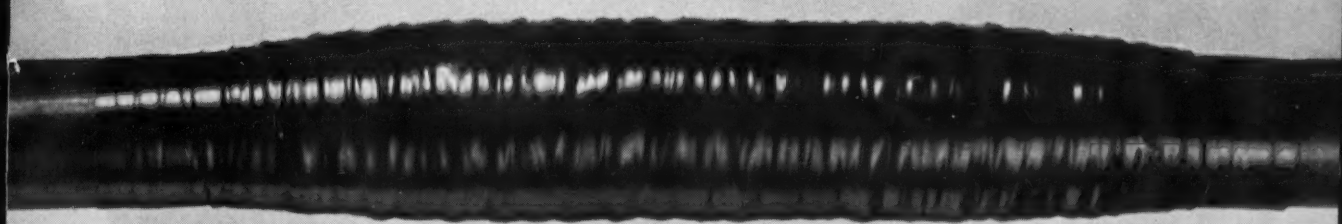
Automated Pinch Valve System

Flexibility of the controlled circuitry to meet any operating requirement is an important advantage of the new system for automatic opening and closing of pinch valves announced by Mine & Smelter Supply Co., 3800 Race St., Denver, Colo. This Massco-Grigsby Hydraul 60 system consists of one or more pinch valves with a single automatically-operated hydraulic pump, operated by electric motor or by air from normal plant supply system. Valves may or may not



be the same size; they may be operated simultaneously or independently; and they may be coordinated and interlocked with other plant equipment to automatically-control tank level, rate of flow, etc.

How many? How often?



How come?

YOU **CAN** CUT DOWN THE HIGH COST OF CABLE MAINTENANCE

This is a splice in a trailing cable for a power shovel, dredge, or other mining machine.

It is also a *slice* . . . right out of your profits. Because cable that's in, on its way in, or on its way out of the splicing shop is cable that's not helping you move coal.

How can you minimize it? Sure, mining is tough on a cable. It crushes it. Scrapes it. Drags it. Twists it. Soaks it. The cable hasn't yet been made that can take this kind of treatment for very long without breaking down at some point.

But Rome's SH-D cable is tailor-made to endure these tortures. Compare these features with those of the cable you are now using.

- Auxiliary internal and external shielding tape to mini-

mize excess voltage stress and ionization.

- A choice of either butyl base or oil-base insulation, depending on the kind of protection you need at your mine.
- Rome's unique shielding braid construction—a combination braid of tinned copper and cotton over each insulated and taped conductor—gives added flexibility and longer life to the cable.
- Covered with tough Rome 60 reinforced neoprene jacket



to give maximum resistance to abrasion and crushing, moisture, oil, heat and the other hazards.

Ask your Rome Cable representative about our SH-D cable. Or write us for details. Rome Cable Division of Alcoa, Dept. 15-31, Rome, New York.

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New Equipment News (Continued)



45- and 62-Ton Rear-Dump Haulers

Increased rated-payload capacities of the two largest rear-dump haulers in the Euclid line—Model R-45 to 90,000 lb and Model R-62 (photo) to 124,000 lb—have been announced by General Motors Corp., Euclid Div., Cleveland 17, Ohio.

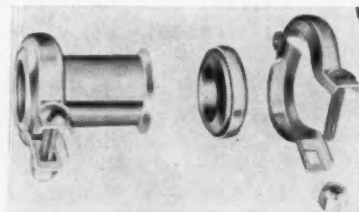
They supersede the 40- and 55-ton rear-dump Euclids. Struck capacity of the R-45 is 30 cu yd and for the R-62

40 cu yd. Use of high-strength alloy steel for all body-wearing surfaces is reported to cut net weight and increase rated payload with no compromise on body strength and durability. It also eliminates the need for bottom plates and "sandwich-type" construction, but exhaust-heated bodies are retained as standard by using body-stiffener channels as exhaust passages.

Lining Compound

"Chem Steel" is a new development for repairing and protecting chutes, hoppers, etc., carrying a slurry of coal and water or other solids in water offered by Ramsey Industries, Chem Steel Div., 302 Main St., Madison, W. Va. Almost completely resistant to ordinary acid water and very wear-resistant, even outlasting steel in many cases, this material can be trowelled on. The principle of this product is a specially-prepared and graded material with a hardness of approximately 9 Mohs scale chemically bonded together and to the surface to which this material is applied. Adhesion is said to be excellent to all

common materials and an excellent bond can be obtained to steel, wood and concrete. Due to the nature of the chemical bond built into this product, it can be applied to any thickness and worked down to a feather edge. Usual application is about 1/4 in. Formulations for lining wet cyclones, rebuilding centrifugal pump casings and wear rings for centrifugal coal dryers are also available.



Improved Pipe Joint

An improved, corrosion-resistant "Flexmaster" pipe coupling, designed to join plain pipe ends quickly and easily without cutting or threading the pipe, is reported to absorb pipe vibration and shock. Allowing up to 4-deg angular misalignment and permitting angular and axial pipe movement without leakage, the Flexmaster fastens with only one nut and bolt on each coupling end for quick-breakaway connections. To assure uniform pressure of the gasket against the

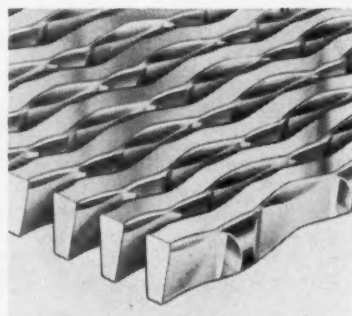
pipe and sleeve, the gasket is now fully contained in the gasket retainer. Redesign of the coupling ends has increased band-tension load to provide a stronger joint. New elbows, crosses and tees are available. Offered by Marman Div., Aeroquip Corp., 11214 Exposition Blvd., Los Angeles 64, Calif., the couplings come in sizes from 3/8 to 4 in and in lengths from 2 to 36 in.

Fire-Resistant Fluids

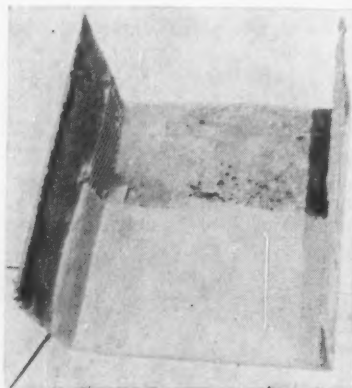
A fire-resistant hydraulic fluid called "Gulf FR Fluid," being marketed by Gulf Oil Corp., P. O. Box 1166, Pittsburgh 30, Pa., is offered the mining industry at a cost said to be competitive with straight mineral oil. An emulsification of 40% water in oil gives the product its resistance to fire. Each droplet of water is coated with oil and in the event of fire, the water droplets turn to steam and snuff it out. USBM tests have confirmed the fluid's fire resistance and additional tests by Gulf as well as analysis of limited field results indicate that Gulf FR Fluid is practical for use under all pressures and temperatures normally encountered in underground mining equipment. Additives compounded with the mineral oil base have been demonstrated as effective in stabilizing the emulsion, improving lubricity and minimizing foaming.

Screen Stops Flats, Slivers

Wedge-Wire Corp., Gas St. & N.P.R.R., Wellington, Ohio, has added to its line the "Poly Kleenslot" screen. Designed to screen out flats and slivers that would normally pass through a typical long-slot screen while maintaining



the same open area and efficiency of a long-slot screen, the new models are manufactured with openings 1 mm and larger. Especially adaptable for flumes or vibrator applications, this screen can easily be interchanged with other types of Kleenslot screens without mechanical changes.



Quality . . . the best economy of all



For extra tonnage, take these two Sun products
underground . . . just these two

Sun 740-A EP, a *universal* mining machine lubricant, is the product miners have been asking for . . . an all-purpose lubricant that clings like grease, pours like oil . . . a product that eliminates *all* other products, except hydraulic fluids, for daily underground use.

Not only does Sun 740-A EP reduce underground oil inventories to two products (Sun 740-A EP and a hydraulic oil), but even more important,

these two partners in production cut maintenance costs as much as 33%, and increase tonnage by keeping equipment at the face longer.

Your Sun man has a safety hat in his car. He knows mining equipment. He knows what's good for it. Get in touch with him, or write SUN OIL COMPANY, Phila. 3, Pa., Dept. CA-3. In Canada: Sun Oil Company Limited, Toronto and Montreal.



MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES





Custom 55-Ton Rear Dumper

A 37-cu yd, 55-ton variable wheel base, rear-dump trailer, adaptable for use with any suitable 2-axle tractor, has been designed by Easton Car & Construction Co., Easton, Pa. Since overall dimensions of the trailer and design of the draft beam for the universal hitch will vary according to the tractor, the "TS-3755" will be built-to-order only. The new trailer is a development from the 50-ton prototype (photo) built by Easton for Western Contracting Co. and is now in use at Bingham Canyon, Utah. Dumping, to an angle of 55 deg, is accomplished by means of two double-acting hydraulic cylinders supplemented by Easton integral-auxiliary control devices. The hoists are fully shielded when the body is in loading and carrying positions. As body is raised to dump position, the wheel base shortens automatically, permitting greater maneuverability. In fully-dumped position, the lip of the body extends well out beyond the tires with good ground clearance. Special high strength, alloy steels are used in body and frame construction of the TS-3755, offered with single or dual tires.

Crawler Tractor

Equipped with a 6-cyl, DT-691 turbocharged diesel engine, the International TD-20 crawler tractor develops 140 engine hp at 1,550 rpm. Boasting 6-speed, full-reverse transmission, the TD-20 has a drawbar horsepower of 113. A 50% increase in torque rise is accomplished through use of all-altitude, modern turbocharging. The TD-20 is equipped with a new dry-type air cleaner which is said to have a 99.8% efficiency in

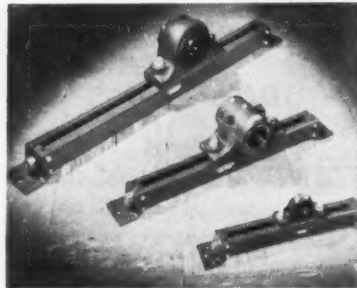


filtering the increased air volume carried into the engine by the turbocharger. This cleaner, with a capacity of 450 cu ft per min, is mounted horizontally under the hood. Servicing is simplified through use of a transparent, quick-dump receptacle and a dash indicator which shows "red" when the element requires servicing. Other features include a gasoline-conversion system with pushbutton, larger radiator top tank and new hydraulic track adjuster with built-in safety relief. Shipping weight is 29,685 lb. Further information available from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

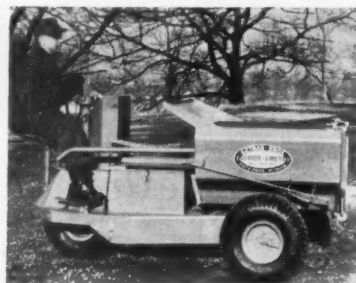


COMPACT TWO-WAY RADIO—Smallest in GE's line of two-way communication units, is the "General Electric Pacer." Designed for operation in low-band (27-50 mc) and high-band (150-174 mc), the units have full-quality VHF-FM audio. Constructed of aluminum and weighing 10 lb, the G-E Pacer will sell for \$419. Measurements are: height, 4 1/4 in; width, 7 1/4 in; and length, 12 1/2 in. It has 15 tubes and two transistors. When the 15-w unit is "on," battery drain is 4.2 amp. The control section contains a transistorized power supply adaptable to 12-V negative or positive ground electrical systems. For more information, write to the company's Communication Products Dept., Lynchburg, Va.

TAKEUP FRAMES—Designed to accommodate any type of bearing in any 2-bolt pillow block with mounting holes up to 5/8 in, Multi-Bearing takeup frames allow horizontal bearing adjustments from 6 to 24 in and will mount



143 different bearing shaft sizes from 5/8 to 2-7/16 in in diameter. One pad is moved by an adjusting screw while the other slides freely to proper distance between pillow-block mounting holes. This mounting flexibility permits each size of takeup frame to accept a wide range of pillow-block bore sizes. Available in 11 sizes from Link-Belt Co., Prudential Plaza, Chicago 1, Ill.

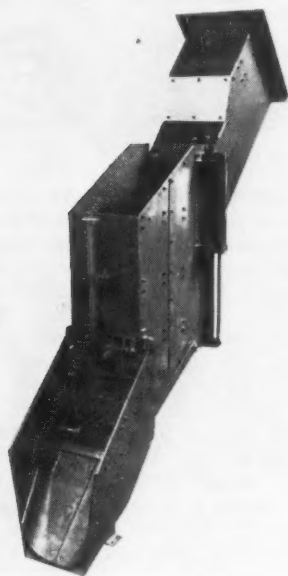


ELECTRIC TRUCK—A battery-powered electric truck for underground mining, known as Model BE-18, has been introduced by Getman Brothers, South Haven, Mich., a company specializing in manufacture of trucks and ore carriers for the mining and other industries. Readily adaptable to all inside work, the new unit has a length of 103 in; width, 43 in; height to top of dump body, 43 in; wheel base, 58 in and dump-box capacity, 2 1/2 yd. It has three forward and three reverse speeds and can carry a 1 1/2-ton load. The BE-18 may also be equipped with an interchangeable platform body.

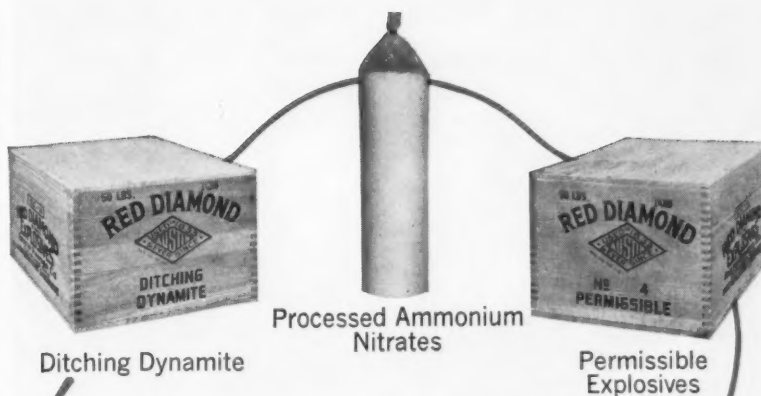
New Equipment (Continued)



VERSATILE DOZER — The Ulrich Model 6H Varidozer is a new blade which can be changed in seconds from a straight blade to an angle blade, forward "V," reverse "V," tilt blade (photo), or to any combination of these positions, by four hydraulic levers next to the tractor seat. Controlled by two hydraulic push arms and two hydraulic tilt cylinders, a huge vertical hinge in the center of the blade, permits each of the two sections to move independently to any position from full 25-deg angle forward to a full 25 deg to the rear. An inside-mounted push frame supports the Varidozer. The push arms contain two fully-protected 6-in cylinders, while two 5-in cylinders allow the entire blade to be tipped 10 deg forward or back and tilted up to 56-in to either side. Designed for use on D6 tractors, this model is first of a series planned by Ulrich Manufacturing Co., Roanoke, Ill.



LOADING POCKET—Automatic loading pockets, when used with Vulcan-Denver automatic skips, are reported to speed the hoisting cycle and reduce manpower requirements. Gates are pneumatically operated, the upper gate



Ditching Dynamite

Processed Ammonium Nitrates

Permissible Explosives

*for all your mine, quarry
and construction needs . . .
use Austin Explosives
and Blasting Supplies!*

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this
new
RAIL WELDING
process requires

NO EQUIPMENT

Newest development in rail welding is the Thermit Self-Preheat process—simplest of all welding methods.

There's no costly equipment to buy and haul in and out of the mine. Materials required come in kits. Each kit contains everything needed to make one weld.

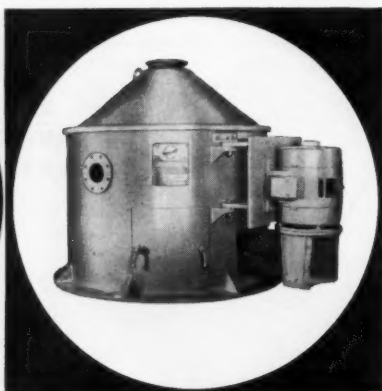
And, because preformed molds are used and preheating of rail ends is unnecessary, you can actually make a rail weld in less than fifteen minutes

Write for detailed information.

THERMIT *Rail* WELDING

Thermex Metallurgical, Inc., Lakehurst, New Jersey

**THE
C.M.I.
COMPACT
26**



NEWEST ADDITION TO THE CMI LINE OF CONTINUOUS CENTRIFUGAL DRYERS

The all new CMI Compact 26 is the first compact dryer for moderate requirements; the first compact dryer specifically

made for a capacity of 20 tons per hour or less of coal or minerals; the first compact at a modest price.

Send for Bulletin 26 which contains complete information.

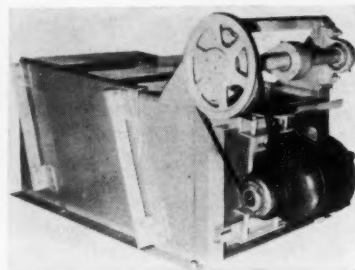
CMI

CENTRIFUGAL & MECHANICAL INDUSTRIES, INC.

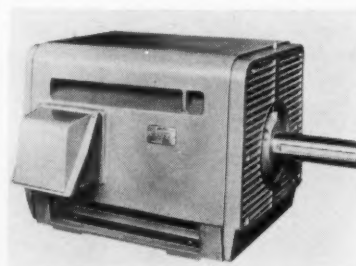
146 PRESIDENT STREET • ST. LOUIS 18, MISSOURI

New Equipment (Continued)

being guillotine type and the lower hinged to open under load pressure when latch arm is raised. Cast liner plates in delivery chute are formed to eliminate spillage around skip. Measuring pocket can be equipped to load by weight rather than volume. Details from Vulcan Iron Works Co., 2961 S. Fox St., Englewood (Denver), Colo.



MATERIALS HANDLING—A new line of vibrating feeders, available in hopper- and flange-type models, is offered by Ridge Equipment Co., P. O. Fallentimber, Pa. Features include volumetric control, leaf-spring suspension and welded-steel construction. Hopper type available in standard models in 40- to 150-tph capacities and flange type, 20- to 200-tph capacities.



MOTOR—A round stator inside a nearly-square frame is the unusual arrangement incorporated in the Duty Master D-5000 motor developed by Reliance Electric & Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio. This arrangement is said to provide better cooling, permitting a smaller overall dimension for any given horsepower rating. Offered from 125 to 300 hp, the D-5000 draws air through large louvered openings covering each end of the motor, ducts it through the rotor and stator and then exhausts it at the sides. Either 220-440- or 550-V models are available for 3600-, 1800-, 1200- and 900-rpm operation.

Equipment Shorts

Lubricant—"Mexacote" is a quick-drying, non-toxic, graphite lubricant de-

New Equipment (Continued)

veloped by U. S. Graphite Co., Div. of Wickes Corp., Saginaw, Mich., for use on railroad and heavy industrial equipment. The lubricant is compounded from a blend of fine Mexican graphite and special oils and, when thinned, is easily applied by brush, swab or spatula. It is packaged in standard 1-gal cans weighing 11 lb.

Dispensers—A new line of heavy-duty dispensers which deliver a full flow of oil and other liquids by gravity when valve is opened, through 1/4-in. O.D. nylon or metal tubing from a central location, is being made by Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wis. Manually-controlled or automatic types are offered. Since these dispensers have no means for feed regulation, single- or multiple-sight feed valves should be used.

Hand-Lamp—USBM-approved permissible hand-lamp, Type PBF-5R, combines a rechargeable 20-amp-hr battery with a powerful bulb. Battery is essentially spill-proof, has corrosion-resistant terminals and automatic-filling control. Built for rugged service, the battery should last at least 3 yr according to Carpenter Mfg. Co., Bradley St., Somerville 45, Mass. Also offered is the PBF-5, companion model, with dry battery-pack.

Chassis—Tailored to meet rugged off-road operations and available for 2- and 2 1/2-ton models on 157- and 175-in wheelbases, a heavy-duty chassis option has been announced by Chevrolet Motor Div., General Motors Corp., General Motors Bldg., Detroit 2, Mich. Features include increased frame strength and rigidity, minimized torsion strain and an alligator-jaw-type cross-member.

Free Bulletins

Diesel Engines—Features of the recently introduced Allis-Chalmers Models 10000 and 11000 diesel engines are described by the illustrated textmatter of Catalog BU-718 now available from the company's Engine-Material Handling Div., Milwaukee, Wis.

Bin Vibrators—Eriez Mfg. Co., Erie 6, Pa., has set forth in Brochure VB-24, their complete line of unit vibrators. Nine models are available, all AC operated, needing no rectifiers and providing pinpointed vibration.

Excavator—Featuring "variable independent control," the new Model 4500 Vicon (6-yd shovel or 7-yd dragline capacity) is fully described in a 16-p



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all the way thru!

Designed to fit
your present
resistor space

P-G **STEEL GRID RESISTORS**
consistently prove their value in
MINING SERVICE

- Steel Construction
- Mica Insulation
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By use of those durable raw materials . . . steel and mica, and the P-G exclusive features of design, these steel grid resistors have the "built-in quality" to overcome factors which often cause resistor failures. Vibration, moisture laden or corrosive atmospheres have little effect on continuity of service. Try Post-Glover Resistors for heavy duty applications where resistors are subject to severe service . . . continuous "Trouble-Free" performance is assured.

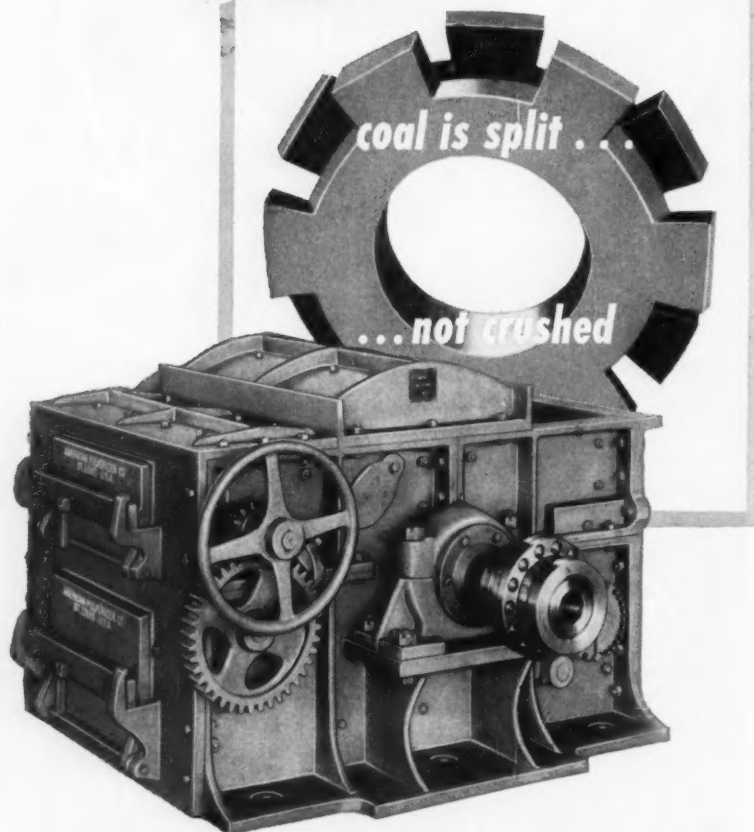


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OVER 50 YEARS



American Rolling Ring Coal Crusher

In 1908 American Pulverizer patented the rolling ring principle of coal reduction. Today there are thousands of American Coal Crushers in operation ranging in size from Sample Crushers to Crushers having a capacity of 800 tons per hour.

American manufactures reduction equipment exclusively, backed by a half century of experience in the production of coal reduction equipment. Although improvements have been consistently made in American Crushers, the rolling ring principle still remains the most efficient method of coal reduction. This fact is **performance-proved** by hundreds of "cost of operations" reports from customers of American Rolling Ring Coal Crushers. May we have our engineers analyze your reduction problem?

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1119 MACKLIND AVE. SAINT LOUIS 10, MO.

New Equipment (Continued)

pictorial catalog offered by Manitowoc Engineering Corp., S. 16th St., Manitowoc, Wis.

Alloy Steel Castings—Those interested in low- and high-alloy and stainless-steel castings will find technical data, charts, etc. in Catalog 175 DS, "Custom Alloy Steel Castings" released by ESCO Corp., 2141 N.W. 25th Ave., Portland 10, Ore.

Mining Equipment—A pocket catalog, entitled "Canton Mining Equipment", describes and illustrates all products of American Mine Door Co., Dueber Ave., Canton 6, Ohio. The booklet is presented to show how to save money with the equipment illustrated. Catalog and specifications also offered.

Cranes and Shovels—Forty basic models of P&H power cranes and shovels to be offered to the mining industry this year are covered in the booklet, "Fabulous 40," offered by Harnischfeger Corp., 4444 W. National Ave., Milwaukee 46, Wis. The new line consists of 17 crawler-mounted excavators, 11 truck cranes, nine electric excavators and three special crawler erecting cranes.

Motor Control—Allis-Chalmers Mfg. Co., 986 S. 70th St., Milwaukee 1, Wis., has published two bulletins describing its "SpaceMaker" products. Type 456, compact, SpaceMaker contactor, designed for starting, stopping and controlling large motors (and for other uses), is featured in Bulletin 14B9740. The SpaceMaker controller, a new concept in high voltage control, is presented in Bulletin 14B9739.

Motorized Wheel—Advantages of GE's motorized wheel drive are set forth in Bulletin GED-4261. Write to the Locomotive & Car Equipment Dept., General Electric Co., Erie, Pa.

Blasthole Bits—A 12-p catalog, featuring specifications and engineering data for "Super-Aire" heavy-duty blasthole bits, has been published by Industrial Products Div., Security Engineering, P. O. Box 13647, Dallas, Tex.

Rubber Products—A completely revised, condensed general catalog (M5) on the company's complete line of rubber products for industry, has been issued by Manhattan Rubber Div., Raybestos-Manhattan, Inc., 42 Townsend Ave., Passaic, N. J.

Wheel Loader—Design features of Caterpillar Tractor Co.'s 922 Series A Traxcavator are detailed in Booklet 34004 released by the Advertising Div. of the company, Peoria, Ill.

Among the Manufacturers

Steve Szekely has been appointed a new representative of Watt Car & Wheel Co., Barnesville, Ohio. His territory will include southern West Virginia, eastern Kentucky and Virginia.



Szekely

Mr. Szekely is a graduate of West Virginia University in mechanical engineering and was formerly employed by the American Car & Foundry Div., ACF Industries, Huntington, W. Va. Watt Car & Wheel Co. are manufacturers of mine cars and related equipment.

Jack K. Adams, formerly manufacturing manager, has been made works manager, Joy Mfg. Co. at No. 1 and No. 2 production plants in Franklin, Pa. Mr. Adams was first employed by Joy in April, 1959, as chief industrial engineer, working out of the Pittsburgh headquarters.



Adams

From 1940 to 1949, he held various management positions with Westinghouse Electric Corp. and its subsidiaries. He replaces **George R. Fox**, recently appointed vice president of manufacturing, Joy International, S.A., a wholly-owned subsidiary.

S. A. Bunis has been named sales manager, Coudts Pumps, Inc., Seneca Falls, N. Y. Associated with the company for 23 yr, he has held the position of assistant sales manager for the past 4 yr. Prior to joining the headquarters office in 1953, Mr. Bunis had traveled extensively as a sales representative in the New England and Middle Atlantic territories.



Bunis

William S. Burdick has resigned as vice president of engineering, Harnischfeger Corp., Milwaukee, Wis., to assume the position of corporate consulting engineer. Robert D. Teece, formerly assistant to the president, has been

named to the post vacated by Mr. Burdick. Replacing Mr. Teece is **Bernard Pratte** who had been general manager of the company's Pacific Div. since 1955.

Donald G. Werdine has been named assistant sales manager, Marathon Coal Bit Co., Inc., Montgomery, W. Va. Mr. Werdine has been with Marathon since 1948 and is an engineering graduate of the Michigan College of Mining & Technology.

Frank T. House, formerly sales promotion manager, has been appointed to the newly-created position of sales services manager, Bucyrus - Erie Co., South Milwaukee, Wis. Mr. House joined the company in 1955 as a small machine sales representative at the firm's Atlanta, Ga., regional sales office. He transferred to the home office at South Milwaukee in 1959 as sales development manager.



House

Tailor-made to give you more efficient blasting! BEMIS EXPLOSIVES BAGS

Bemis Explosives Bags for ammonium nitrate and nitro-carbo-nitrate are tailor-made to your requirements—to give you more efficient blasting.

More economical: Use of Bemis Explosives Bags and ammonium nitrate mixtures can save up to 50 percent on explosives costs.

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Wet hole or dry hole . . . you'll get top efficiency at minimum cost with . . .

Bemis Burlap Bags with heavy-duty polyethylene liners. The rugged burlap absorbs the punishment of handling or jagged holes. Poly liner provides waterproofness.

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Flexibly® Bag with poly liner. Here three plies of rugged creped wet-strength kraft provide the toughness.

Laminated Bags. Constructions of burlap, kraft paper, polyethylene and pliofilm—in varied combinations—are all performing satisfactorily in the pits and on construction sites.



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Joe Ambrosio likes the independence of being in business for himself. His independence hinges on success . . . and a big part of Joe Ambrosio's success comes from reliable used equipment . . . the kind he buys from his Caterpillar Dealer.

Four years ago Joe bought a used D6 and learned that there's a big difference between used Cat equipment and other used equipment. Early in 1959 he went back to his dealer, bought a *Bonded Buy* 977 Traxcavator. "The loader's done better than I expected," Joe says. "It's worked almost every day since I got it—backfilling, rough grading, loading, clearing trees, dozing rock. It's been as dependable as a new machine."

If you're setting up a spread, getting your start as an independent businessman; or if you're adding to your existing spread for a busy season . . . there are no better values than *Bonded Buy* used Cat equipment.

If you want a sure thing, see your Cat Dealer. His business is built on sure things.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

**BEST BUYS IN NEW
AND USED EQUIPMENT**

Erwin A. Wendell has been promoted to manager of advertising and public



Wendell

relations, Link-Belt Co., with headquarters at the Chicago office. A Link-Belt employee since 1917, Mr. Wendell served in the engineering and sales departments until 1937 when he was appointed manager of the St. Louis district office. In 1944 he became manager of the Chicago district office and 3 yr later was named sales manager for the Caldwell plant in Chicago. He joined the executive sales division in 1953 and was made assistant advertising manager last August. His appointment follows retirement of Bertram V. Jones who had been advertising manager for the past 10 yr and a member of the advertising department since 1923.

Jack L. Berkebile has been promoted to sales manager, Penn Machine Co.



Berkebile

of Pittsburgh and Johnstown, Pa. Mr. Berkebile has been associated with Penn Machine for the past 24 yr and for the last 5 yr has served as district sales manager for the company in the Pennsylvania, Ohio and West Virginia area. He is a member of the AIEE, ME-MMA, Northern W. Va. Coal Mining Institute and the Northern Cambria Coal Mining Institute.

Company Briefs

Five new outlets have been named by the Carmet Mining Tool Div., Allegheny Ludlum Steel Corp. They are: the Fairmont Supply Co. with distributing centers in Fairmont, W. Va.; Bluefield, W. Va.; Washington, Pa. and Youngstown, Ohio; as well as Fairmont's subsidiary, Somers, Fitlers & Todd Co. of Pittsburgh.

Raybestos-Manhattan, Inc., Passaic, N. J., has completed plans to sell its new compact Poly-V "J" Drive through industrial distributors in order to properly supply the needs of the replacement market and the increasing number of small equipment and component manufacturers using compact drives. During its introductory period this drive was sold only through equipment manufacturers. Now both belts and sheaves will be carried by distributors.

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a specialist who knows the ground
you are exploring?

Coal Age, meeting place of men
in all parts of the country, points the
way to the solution of many problems
through its Professional Service Sec-
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Railroad Track Specialists

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Mining Engineers

COAL OPERATION CONSULTANTS
VALUATIONS

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Modern Production Methods
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"Founded 1900"

Consulting Engineers

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Mining Consultant and Engineer

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Consulting Engineers

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Coal Property Valuation
Industrial Engineering

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Consultant on

HYDRAULIC OILS FOR MINES &
COAL SPRAYING OILS & EQUIPMENT.
702 Benoni Ave., Fairmont, W.Va.

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Drill Contractors Since 1902

Specialists in exploratory—grout hole and pressure
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Established 1936

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DESIGN AND CONSTRUCTION
INDUSTRIAL ENGINEERING

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Complete appraisal of coal-mining operations with
special recommendations for reduction of production
cost and increase of coal sales. Negotiations for
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THE CONSULTING ENGINEER

"By reason of special training, wide experience and tested ability, coupled with professional integrity, the consulting engineer brings to his client detached engineering and economic advice that rises above local limitations and encompasses the availability of all modern developments in the fields where he practices as an expert. His services, which do not replace but supplement and broaden those of regularly employed personnel, are justified on the ground that he saves his client more than he costs him."

For the solution of your problems, consult the Professional Services Section of Coal Age.

CLASSIFIED

SEARCHLIGHT SECTION

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EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

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The advertising rate is \$12.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

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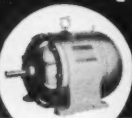
An ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page.

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(Not available for Equipment Advertising) \$1.50 a line. Minimum 3 lines. To figure advance payment count 5 average words as a line. (See ¶ on Box Numbers.)

POSITION WANTED undisplayed rate is one half of above rate, payable in advance. BOX NUMBERS count one additional line.

Send New ADS or Inquiries to Class. Adv. of Coal Age, P. O. Box 12, New York 36, N. Y., For April Issue Closing March 20th

POWER EQUIPMENT CO.
OffersBARGAIN
PRICES

ON GUARANTEED
NEW and Rebuilt
MOTORS!

MAR. SPECIALS

GUARANTEED REBUILT MOTORS
230 Volt DC Compound Wound
Unless Otherwise Noted

HP	MAKE	TYPE	SPEED
150	G.E.S.B. Open	RC	900
100	Wes. S.B. Open	SK-142L	1800
100	Wes. S.B. Open	SK-170	900
100	CW TEFC BB	S3 HFC	900
75	Wes. S.B. Open	SK-140L	1800
75	Wes. S.B. Open	SK-160	900
60	GEBB Drip	CDM-95	1800
60	Al. Chal. S.B. D	DE-131	1200
40	L.A.B.B. Splash	FRA-405	1800
40	Con. BB D. Hw	DN-375	1800
30	Wes. BB D. H	SK-93	1800
30	L.A.B.B. Drip	OGNA-404	1800
25	Cent. B.B. Drip	D-364	1800
25	GEBB Shunt	CD-93	1200
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Large line of motors, control equipment, AC
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Phone BEverly 5-1662

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DRAGLINES, SHOVELS, CRANES, DRILLS, TRUCKS

9-W B.E. Elec. Drag, 200', 8 yd. or 160', 10 yd.
9-W B.E. Diesel Drag, 165', 12 yd.
7-W B.E. Diesel Drag, 140', 7 yd.
7400 Marion Diesel Drag, 175', 13 yd.
71-B B.E. Crane with 160' boom
625 Page Diesel Drag, 150', 10 yd.
531 Page Elec. Drag, 200', 8 yd.
621-S Page Diesel Drag, 125', 7 yd.
200-W B.E. Diesel Drag, 125', 6 yd.
2400 Lima Elec. Drag, 130', 6 yd.
2400 Lima Diesel Drag, 130', 6 yd.
7200 Marion Diesel Drag, 135', 5 yd.
4500 Manitowoc Drag, 120', 5 yd. & 140', 4 yd.
120-B B.E. Elec. Drag, 115', 5 yd.
111-M Marion Drag, 100', 4 yd.
1055 P&H Diesel Drag, 80', 4 yd.
1601 Lima 4 yd. Shovel/Drum
3900, 3500 & 3000 Manitowoc Cranes
5560 Marion 26 yd. Elec. Shovel
5323 Marion 18 yd. Elec. Shovel
190-B B.E. 8 yd. Elec. Shovel
151-M Marion 7 yd. Elec. Shovel
1600 P&H 6 yd. Elec. Shovels
170-B B.E. 6 yd. Elec. Shovel
4161 Marion 6 yd. Elec. Shovel
2400 Lima 6 yd. Std. H. L. Shovels
120-B B.E. & 4121 Marion 4 yd. Elec. Shovels
4500 Manitowoc 5 yd. H. L. Shovel
1055 P&H 3 yd. H. L. Shovel
1201 Lima 3 1/2 yd. Standard Shovel
111-M Marion Standard & H. L. Shovels
3500 Manitowoc Standard & H. L. Shovels
54-B B.E. Standard & H. L. Shovels
Model T-650 REICHDriil Truck Mtd. Rotary &
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Euclid Trucks, Dozers, Attachments, etc.

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All makes and Models
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Two hundred tons of coal per hour, 3412
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Excellent opportunity for graduate mining en-
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Engineer, Future V.P. Unusual opportunity for
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preparation helpful but not essential. Proper
individual will acquire managerial status. Send
experience and earnings record in confidence.
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Mining Engineer, Registered Va. and W. Va.
20 years engineering and Supervisory experience
all types mining and related construction with
only two companies. Excellent references. PW-
6231, Coal Age.

2 TELEPHONES \$24-95

Inter-communication handsets, two
wire system, included Two 3 volt
batteries, 50 ft. of wire and
simple wiring instructions. Additional
wire 1 cent per ft. or \$25.00 per
mile. Complete list of telephone
parts, handsets, magneto-com-
mon battery—etc. All shipments
FOB Simpson, Penna.

Write for free list.

Telephone Engineering Co., Dept. CA-31, Simpson, Pa.

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HEAVY-MEDIA COAL WASH PLANT

250 tph Capacity
Including

WEMCO cone, separator and classifier.
ROBERTS-SHAFFER dehydrator.
Steel and Aluminum building.
Control panels, wiring and motors

ENTIRE PLANT
located on railroad siding in
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Condition - Excellent
Priced right for quick sale.

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100—70 ton cap. Covered Hopper Cars
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Has purchased the St. Ellen Mine of Peabody Coal Company, O'Fallon, Illinois, located on U. S. Route 50, approximately fifteen miles east of St. Louis, Missouri. The entire stock of equipment and approximately 400 acres of land are being offered for sale at bargain prices.

J. J. MAHONEY AND ROY FAIRCHILD CAN BE CONTACTED AT THE MINE SITE AT ALL TIMES

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THE FOLLOWING IS A PARTIAL LISTING OF EQUIPMENT FOR SALE AT THE MINE SITE

SHUTTLE CARS, 250 VOLTS DC

- 11—Joy 10SC Shuttle Cars, right and left hand drive.

CUTTING MACHINES, 250 VOLTS DC

- 5—10RU Joy Cutting Machines.
- 2—324 AA Goodman Slabbers—Track Gauge 42".

TROLLEY LOCOMOTIVES, 42" TRACK GAUGE FOR 250 VOLT DC

- 1—13 ton Goodman—Type 81A04T, completely modern.
- 1—Goodman 13 ton 136B-0-4-6 with 2—75 H.P. Motors.
- 2—13 ton Jeffrey Locomotives (1—inside frame and 1—outside frame).
- 1—Goodman 5 ton 3013 with 1—50 H.P. Motor
- 4—8 ton 132AK42-48R Goodman with 2—50 H.P. Motors with reels.
- 1—8 ton 32-0-4-T Goodman with 2—50 H.P. Motors with reels.
- 1—8 ton LM2-8-T-DD General Electric with 2—50 H.P. Motors with reels.
- 3—6 ton LM2-T-6MM General Electric with 2—35 H.P. Motors with reels.
- 2—6 ton LM2-4-6-11 General Electric with 2—35 H.P. Motors with reels.

BATTERY LOCOMOTIVES, 42" TRACK GAUGE

- 18—Greensburg Monitors complete charging equipment and batteries.
- 4—Mancha Locomotives complete with charging equipment and batteries.

LOADING MACHINES, 250 VOLTS DC

- 6—11BU Joy Loading Machines, completely modern with separate pump motors.
- 3—300 Goodman Loading Machines.

MOTOR GENERATOR SETS

- 4—General Electric 300 KW Motor Generator Sets, 1200 RPM, primary voltage 2300/4160, 275 Volts DC, complete with panel boards.
- 3—General Electric 200 KW Motor Generator Sets, primary voltage 2300/4160, 1200 RPM, 275 Volts DC, complete with panel boards.
- 1—Westinghouse 200 KW Motor Generator Set, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.
- 2—Westinghouse 150 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.

CONVEYORS

- 3—Joy PL 11 Elevating Conveyors.
- 3—Joy PL 11 Side Dumps.

BELT CONVEYORS

- 1—Hewitt-Robins Slope Conveyor, 980 ft. long, 42" wide, equipped with 200 H.P. 440 Volt AC Drive (also 50 H.P. 440 Volt AC Motor for man trip), complete with 42" x 6 ply Rubber Conveyor Belt, Ajax Raynile #130 1/4" top cover and 1/16" bottom cover with Nylon Breaker.
- 4,000 feet of Rubber Belt 36" wide.
- 1—40 H.P. Goodman 36" Belt Drive with Tail, 250 Volts DC.
- 1—Robins Belt Conveyor 38" wide, 150 ft. long complete with Allis-Chalmers, 30 H.P., 220/440 Volt AC Drive.

MINE CARS

- 100—AC&F, Three-Door Drop Bottom Mine Cars, 48" High, 17 ft. 7 1/4 in. overall length, capacity 271 cubic feet level full, 42" gauge.
- 100—Sanford-Day Three-Door Drop Bottom Mine Cars, 38" high with an 8" sideboard, 16 ft. 10 1/2" overall length, 42" gauge.

WIRE MATERIAL

- 2,500 ft. 4/0 Round Return Wire.
- 2,000 ft.—500,000 CM.
- 4,000 ft.—1,000,000 CM.
- 10,000 ft.—6/0 Trolley Wire.
- 8,000 ft.—4/0 Rubber Covered 4000 Volt Power Cable.

TRACK MATERIAL

- 75—40# Switches.
- 1,000—40# Ties.
- 1,000 Tons—60# Rail.
- 51—60# Switches.
- 1,000—60# Ties.

COMPLETE FOUR-TRACK TIPPLE CAPABLE OF HANDLING 10,000 TONS OF COAL PER DAY PARTIAL LIST OF MAJOR ITEMS OF TIPPLE:

- Sizes of coal: from 1/4 x 0 to 7 x 4" Block.
- CMI 48" Dryer—complete with motors, drives, belt, etc., screen cloth 1/16" opening capacity 90 ton per hour.
- 1—Coppus Ventair Blower #24708.
- Pulverizers: (American Pulverizers) 4—# 305, Ser. #3218—AC3, Serial #1798, AC3B, Ser. #3127, WC-24, Ser. #3240.
- 5—8 x 6 Allis-Chalmers Centrifugal Pumps, complete with motors (4) breakers.
- 1—16 x 14 Allis-Chalmers Centrifugal Pump, complete with motor, starter, breakers.
- 1—Roberts & Schaefer Electric Vibrator.
- 1—Roberts & Schaefer Air Drying Plant, complete (specifications furnished on request). Consists of Belt & Chain Conveyors complete with motors, drives, 36" Belt also some 24" and 30" Belt.

WELDERS

- 1—Lincoln, 300 amp. M.G. Set.
- 2—Hobart, 300 amp. M.G. Sets.
- 1—G.E., 400 amp. M.G. Set.
- 4—Guyan 200 amp. Resistance Welders.

AUTOMATIC RECLOSING BREAKERS

- 2—1600 amp. I.T.E. Modern with reverse current relay.

AIRDOX EQUIPMENT

- 5—Armstrong 60 H.P., AC 440 Volt Compressors.
- 5—Armstrong Coal Breakers, Model EB-301.
- 5—G.E. Motors 60 H.P., Type K, Frame 504, 220/440 Volt AC, 1180 RPM.

Auxiliary equipment and controls complete

PORTAFEEDER

- 1—Noian Portafeeder.

COAL DRILLS

- 5—Manson Trucks—10 H.P., DC Tram Motors on 4, 7 1/2 H.P. DC Tram Motors on 1, Joy 9 J Motor with Reduction on 1. Each drill truck has 2 drill arms with 2 Chicago Pneumatic 580 Drills 7 1/2 H.P., DC.
- 3—Manson Track Trucks, each truck with 2 drill arms & 2—580 drills.
- 2—Manson Track Trucks, without drills.
- 9—Dooley Rubber Tired Trucks, equipped with two arms and two 580 drill motors.

ROOF DRILLS

- 1—Joy RBD-7 with 15 H.P. Reliance Permissible DC and mounted on Manson with 7 1/2 H.P. Westinghouse on Rubber.
- 1—Jeffrey 56 R.D. with 15 H.P. Motor DC, arm is mounted on Manson Track Truck.
- 1—Dooley (Rubber Tired) Drill Truck, equipped with Vertical Drilling 580 Drill Motors.

ROCK DUSTERS

- 1—American Mine Door Road Cleaner.
- 2—MSA Rock Dusters, 25 H.P. Track.
- 3—MSA Bantam Rock Dusters, 2 H.P.

TRUCKS

- 2—(Shop Built) Mobile Repair Trucks.
- 4—Personnel Jeeps, 42" Track Gauge.

FANS

- 1—Jeffrey Aerodyne Fan, Serial No. 8687 complete with G.E. 100 H.P., 440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline driven.
- 1—4 ft. Jeffrey Aerodyne Fan complete with 60 H.P., 220/440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline drive, complete with all necessary equipment and controls.

TRANSFORMERS

- 3—2400/4160 Y, 240-480 Volts, 100 KVA General Electric Single Phase Transformers.
- 3—2400/4160 Y, 240-480 Volts, 333 KVA General Electric Single Phase Transformers.
- 3—2300/4160 Y, 230-115 Volts, 200 KVA General Electric Single Phase Transformers.
- 3—2300/115/230 Volt, 15 KVA General Electric Single Phase Transformers.

SUPPLY HOUSE

Complete inventory of new parts for 10SC, 10RU and 11BU Joy Equipment plus cable, tools, hardware, etc. for operation of mine.

BATHHOUSE EQUIPMENT

- 355—Baskets with Chains, 20 shower heads and complete equipment for operation of bathhouse.

LAMP HOUSE

- 360—R4 Cap Lamps complete with necessary charging equipment.
- 25—Flame Safety Lamps.

MOBILE EQUIPMENT

- 1—Kochling Heavy Duty Crane—C5521.
- 1—Shovel Dipper Stock for same—Size 301, Serial No. 61, Length 16 feet—3/4 yard dipper.
- 1—International 1950 Flat Bed Truck Tandem with steel bed and wench, Ser. #3436, 3 axles, weight 18,500 lbs.
- 1—Hough Pay Leader, Model HF and HFN, Serial No. 81221.
- 1—Allis-Chalmers Tractor HD9-B27.
- 1—Allis-Chalmers Tractor HI Lift—Model HD5, Model #24-27482, Serial No. 22246.
- 1—Caterpillar Tractor D6, 60" Gauge, Serial No. 5R4778.
- 1—Whiting Track Mobile, Serial #TM-209.
- 1—Roller—W. M. Bros. Boiler Mfg. Co., Model 678, Ser. #RR-2734, weight 2950 lbs.

COMPLETE SHOP AND OFFICE EQUIPMENT

STATIONARY MOTORS

AC and DC Motors ranging from 1 to 300 H.P.

GENERAL MISCELLANEOUS

Hundreds of other items such as pumps, motors, armatures, locomotive trucks, wheel units, hydraulic pumps, conveyor chains, cat chains, tipple draglines, etc., too numerous to list.

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Res. Phone CLifford 3-6804, Beckley

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Largest Supplier of the Best Rebuilt Mining Equipment

CONTINUOUS MINERS

- 1-3 JCM Joy Continuous Miner, 250 V. D.C., Excellent Condition

CUTTING MACHINES

- 5-12RB Joy Cutting Machines, 250 V. D.C., Permissible, Dual Wheels, Bugdusters, 9' Bar, Excellent Condition
5-11RU Joy Cutting Machines, 250 V. D.C., Permissible, Bugdusters, one completely rebuilt
1-70 URB Jeffrey Cutting Machine, 250 V. D.C., Excellent Condition
1-29U Jeffrey Cutting Machine, 220/440 V. A.C., Completely rebuilt, 36" t.g.
16-512 Goodman Cutting Machines, 250 V. D.C., Hydraulically or Manually Controlled
1-624 Goodman Slabber, 250 V. D.C.
48-35B and 35BB Jeffrey Cutting Machines, A.C. and D.C.
6-7AU Sullivan Cutting Machines, 250 V. D.C.
5-7B Sullivan Cutting Machines, 250 V. D.C.
16-11B Sullivan Cutting Machines, 35 & 50 h.p., 250 V. D.C.
17-12AB, 12AA and 112AA Goodman Cutting Machines, 250 V. D.C.
7-212AA Baby Goodman Cutting Machines, 250 V. D.C.

BELT CONVEYORS

- 1-36" Joy Model "C" Belt Conveyor, 1,080' centers
7-MTB 30 Joy Tandem Belt Conveyors, 1,000' centers, 25, 40 and 50 h.p., one with Scandura Flame Proof Belting
1-30" 97HC Goodman Belt Conveyor, 1,000' centers with 25 h.p. Tandem Drive
4,280'-30" 99-SGT Goodman Belt Conveyor Structure
5-99-SGT Tandem Belt Conveyor Drives
1-30" Shop Constructed Belt Conveyor Drive
288'-30" Barber Greene Belt Conveyor Structure
8,760'-26" Joy Model "C" Structure
18-26" MTB Joy Tandem Belt Conveyor, 1,000' centers

LOADING MACHINES

- 3-11BU Joy Loaders, 250 V. D.C.
5-8BU Joy Loaders, A.C. & D.C., rebuilt
3-14BU-7RAE Joy Loaders, 250 V. D.C.
2-14BU-7BE Joy Loaders, 250 V. D.C.
6-14BU-3PE Joy Loaders, 250 V. D.C.
8-14BU-2E Joy Loaders, 250 V. D.C., 28" O.H.
3-12BU-9E Joy Loaders, 250 V. D.C., rebuilt
4-20BU Joy Loaders, 250 V. D.C., Permissible
1-360 Goodman Loader, on rubber, 250 V. D.C.
6-Long 88 Pig Loaders, 250 V. D.C.
1-24BB Clarkson Loader, 250 V. D.C.
1-Eimco 21 Rock Loader

SHUTTLE CARS

- 5-60E-10 Joy Shuttle Cars, w/Elevators, matched pairs, 250 V. D.C.
9-42E Joy Shuttle Cars, 250 V. D.C.
5-55C Joy Shuttle Cars, w/Elevators, 250 V. D.C.
17-65C Joy Shuttle Cars, matched pairs, 250 V. D.C.
2-85C Joy Shuttle Cars, Elevating Discharge, Permissible Plates, Excellent Condition, 250 V. D.C.
17-32E-10 & 32E-16 Joy Shuttle Cars, Excellent Condition, 250 V. D.C.
3-32D Joy Shuttle Cars, complete w/batteries
2-MT66-A45 Jeffrey Shuttle Cars, 250 V. D.C., matched pair, permissible, Excellent Condition

MISCELLANEOUS TRACKLESS EQUIPMENT

- 1-WK-83R Joy Compressor, 240 cu. ft.
1-WL-82R Joy Compressor, 125 cu. ft.
2-T2-5AE & T2-2E Joy Machine Trucks
2-T14G Joy Machine Trucks, 220 V. A.C.
1-Lot 9J, 10J, 23J and 24J Motors

PREPARATION EQUIPMENT

- 1-4-Cell Jeffrey Baum Jig Washer, complete, 300 t.p.h. capacity
1-Simon Carver Heavy Duty 2 compartment Baum Jig, 400 t.p.h. capacity

- 1-Daniels Heavy Media Washer
1-48" CMI Centrifugal Dryer
1-Heat Dryer, complete
1-36" x 130' Hot Material Handling Belt, Excellent
1-36" Belt Conveyor, 225' centers, complete
1-36" Belt Conveyor, 100' centers, complete
1-36" Belt Conveyor, 60' centers, complete
4-7' x 15' Single Deck Diester Tables
1-36" x 36" Jeffrey Single Roll Crusher
1-36" x 33" Marion Double Roll Primary Crusher
1-30" x 36" Jeffrey Double Roll Crusher, Like New
1-30" x 30" Link Belt Double Roll Crusher
1-24" x 50" Pa. Single Roll Crusher
2-24" x 24" Jeffrey Single Roll Crushers
1-2' x 4' Williams Pulverizer
1-18" x 24" McClanahan & Stone Single Roll Crusher
1-18" x 12" Jeffrey Swing Hammer Pulverizer
1-6' x 16" Allis Chalmers Double Deck Low Head Vibrator
1-6' x 14' Single Deck Allis Chalmers Low Head Vibrator, Like New
1-5' x 16' Triple Deck Allis Chalmers Ripl-Flo Vibrator, Like New
1-5' x 16' Single Deck Allis Chalmers Low Head Vibrator, Like New
2-5' x 12' Allis Chalmers Single Deck Low Head Vibrators
1-5' x 12' Allis Chalmers Ripl-Flo Double Deck Vibrators
1-5' x 10' Double Deck Robbins-Gyro Vibrator, Like New
1-4' x 12' Hewitt Robbins Vibrex Screen, Triple Deck
5-4' x 7' Jeffrey Traylor Double Deck Vibrators
2-4' x 7' Jeffrey Traylor Single Deck Vibrators
1-3' x 4' Single Deck Gyro Vibrator
1-3' x 8' Low Head Vibrator
1-30" x 72" Jeffrey Traylor Double Deck Vibrator
1-2' x 5' Lecco Single Deck Vibrator
1-2' x 5' Selectro Double Deck Vibrator
9-24" x 90" Jeffrey Traylor Vibrators, w/M.G. Sets
2-Magnetic Separators, complete
1-Set Jeffrey Dewatering Screens
10-Scraper Conveyors of various sizes
14-Drum Conveyors of various sizes
1-970' Jeffrey Rope & Button Conveyor
12-Boom Hoists from 1 ton to 5 ton
We can construct loading booms and tippie belts in any size.

- CHAIN AND SHAKER CONVEYORS
20" Joy Chain Conveyors, A.C. & D.C., Permissible
15" Chain Conveyor Drives, A.C. & D.C., Permissible
15" Long Chain Conveyors, A.C. & D.C.
12" & 15" Jeffrey Chain Conveyors
12" Goodman Chain Conveyors
PT12 Long Piggyback Conveyors
PT12-B Long Piggyback Conveyors
Goodman G12's, G15, & G20 Shaker Conveyor Drives
Joy Ladell UN17 Shaker Conveyor Drives
Goodman Power Duckbills & Duckbill Hoists

LOCOMOTIVES

- 3-20 Ton Jeffrey MH77 Locomotives, 42" & 48" t.g.
1-15 Ton HM828 G.E. Locomotive, 90 h.p., units, 44" O.H., 48" t.g., Excellent
1-14 Ton MH110 Jeffrey, 42" t.g.
16-13 Ton Locomotives, 250 V., any gauge
1-12 Ton 29B Goodman Locomotive, 40" O.H.
12-10 Ton Locomotives, 250 V., any gauge
22-8 Ton Locomotives, 250 V., any gauge
8-7 Ton Atlas Battery Locomotives
29-6 Ton Locomotives, any gauge
4-6 Ton Jeffrey MH150 Locomotives
15-5 Ton MH88 Jeffrey Locomotives
2-6 Ton Mancha Battery Locomotives, 36" t.g., 47" O.H.
11-5 Ton Locomotives, 250 V.
17-4 Ton Locomotives, 250 V., any gauge
1-4 Ton G.E. Battery Locomotive, 48" t.g.
1-4 Ton Mancha Battery Locomotive, 48" t.g.

SUB STATIONS & TRANSFORMERS

- 1-Westinghouse A.C. Sub Station, 4500 KVA, 6900/2300, complete w/boards, Excellent
4-300KW M.G. Sets

- 5-200KW M.G. Sets
4-200KW, HCC-6-1200 G.E. Rotary Converters, Automatic
3-150KW G.E. Rotary Converters, w/Transformers
1-150KW Westinghouse Rotary Converter, Completely Automatic
19-150KW M.G. Sets of various makes & voltages
2-100KW M.G. Sets
1-100KW Westinghouse Generator, 250 V. D.C., connected to Buda Diesel Engine, complete w/boards
2-100KW Generators, w/671 G.M. Diesel
1-90KW Generator, w/671 G.M. Diesel, Excellent
1-75KW Generator, w/10019 Diesel Engine
1-75KW Generator, w/75 h.p. G.M. Diesel w/ITE Automatic Control Board
1-100KVA Gasoline Alternator Unit
1-50KW M.G. Set, 125 V., D.C., 1200 rpm
2-Armatures for 200KW Rotary G.E., Type HCC
2-600 & 800 Auto Transformers
179-Transformers from 1 1/2 KVA to 800KVA, list sent upon request

MINE CARS

- 50-36" t.g. Phillips Clay Cars, 50" O.H., Excellent
50-36" t.g. Steel Mine Cars, end dump, 40" O.H.
90-36" t.g. Drop Bottom Cars
155-42" t.g. End Dump Cars, various makes
147-42" t.g. S. D. Drop Bottom Mine Cars
17-42" t.g. A.C.F. Drop Bottom Cars
22-44" t.g. Drop Bottom Cars, 10 ton capacity
130-44" t.g. Drop Bottom Cars, various sizes
333-44" t.g. End Dump Cars, various sizes
327-48" t.g. S. D. Drop Bottom Cars
259-48" t.g. A.C.F. Drop Bottom Cars
2-56 1/2" t.g., 3 Ton, 4 Wheel Push Trucks (New)

RAIL AND WIRE

- 1,372-Tons 30, 45, 56, 65, 70, 90 & 100 lb. Relaying Rail
325'-2,000,000 CM Bare Copper Feeder Cable
3,569'-1,000,000 CM Bare Copper Feeder Cable
7,357'-500,000 CM Bare Copper Feeder Cable
15,000'-2/0, 3 Cond. Copper Cable, Insulated
37,600'-1/0 Solid Copper Highline Wire
15,000'-#1 Solid Copper Highline Wire
2,643'-#2 Stranded Copper Highline Wire
160,400'-#2 Solid Copper Highline Wire
1,595'-#4 Solid Copper Highline Wire
3,773'-#6 Solid Copper Highline Wire
10,130'-4/0, 3 Cond. rubber covered cable, 5,000 V., Excellent condition
5,000'-2/0, 3 Cond. Anhydrex & Lead covered Transmission Cable
8,000'-2/0 Single Cond. Insulated Copper
7,500'-2/0 Insulated Cable, 600 V.
1,500'-600 V. Bronco 60 Neoprene certified type W. 2 Cond., #6 Copper Wire
P116BM, like new
Several Thousand feet #2, #3 and #4 approved type machine cable.

MISCELLANEOUS

- 1-Canton Track Cleaner, Excellent
16-HKL, HKC, HKC, HL & CH Brown Fayro & Sullivan Hoists
48-Air Compressors of various sizes
57-Auto Starters from 3 h.p. to 100 h.p.
81-Hoists from 1 1/2 to 800 h.p.
13-Shop constructed Jeeps, track mounted
7-Hydraulic Schroeder Coal Drills
150-Pumps from 3/4" to 4500 GPM
17,270'-Pipe: Galvanized, Plastic & Cast Iron
99-Coal Drills, various makes and sizes
1-300 GPM 6" Pomona Deep Well Pump
1-14" Centrifugal Slurry Pump
44-Room Blowers-Brown Fayro & Jeffrey
32-Mine Fans from 30" to 9' Hi Pressure
17-Battery Chargers, various voltages
15-Rock Dusters up to 30 h.p.
4-Phillips Machine & Shuttle Car Carriers, 36" to 48" t.g.
1-42 Ton Richards Truck Scale, 10' x 25' deck
775-Stationary Motors-1/2 to 800 h.p., A.C. and D.C. (List of motors available upon request)
11,200'-3" Plastic Pipe
800'-4" Plastic Pipe

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Check our listing of modern mechanical equipment—whether to completely mechanize or further mechanize your operation—we offer the most complete stock of used and rebuilt machinery.

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A. C. MINING EQUIPMENT FOR SALE

- 1—12G-3 Goodman Cutting Machine, A.C.
- 2—11BU-10APH Joy Loading Machines, 220/440 Volts A.C.
- 4—4JCM Joy Continuous Miners, 440 Volts A.C.
- 3—7B Sullivan Cutting Machines, 220/440 Volts A.C.
- 1—35L Jeffrey Cutting Machine, 220 Volts A.C.

LOADING MACHINES FOR SALE

- 1—14 BU-7RAE Joy Loading Machine, 250 Volts D.C.
- 1—18 HR Joy Loading Machine, 250 Volts D.C.
- 4—11 BU-10APE Joy Loading Machines, 250 Volts D.C.
- 1—14 BU-7BE Joy Loading Machine, 250 Volts D.C.
- 2—14 BU-3PE Joy Loading Machines, 250 Volts D.C.
- 6—12 BU-9E Joy Loading Machines, 250 Volts D.C.
- 4—8 BU Joy Loading Machines, 250 Volts D.C.
- 3—7 BU Joy Loading Machines, 250 Volts D.C.
- 2—Long 12" Piggyback Conveyors, each 300' long, complete with PT-12 Piggybacks and 12BU Joy Loading Machines.
- 2—14BU-7BE Joy Loading Machines, 250 Volts, DC, excellent condition.

SHUTTLE CARS FOR SALE

- 4—10SC Joy Shuttle Cars, 500 Volts DC.
- 2—32E-16 Joy Shuttle Cars, 250 Volts D.C.
- 1—570-48 Goodman Shuttle Car, 250 Volts, D.C.
- 1—55C Joy Shuttle Car, Elevating Discharge, Disc Brakes, 250 Volts D.C.—Modern.
- 6—58C-7E Joy Shuttle Cars, Elevating Discharge, 4-Wheel Steering, 250 Volts D.C.
- 3—42E18 Joy Shuttle Cars, Disc Brakes, Elevating Discharge, Completely Modern, 250 Volts, D.C. 2-Standard, 1-Opposite Standard Drive.
- 1—32E16 Joy Shuttle Car, Disc Brakes & Elevating Discharge
- 1—42E15A Joy Shuttle Car.
- 2—60-E Joy Shuttle Cars, 250 Volts D.C.
- 1—10SC-2BPE Joy Shuttle Car, Permissible, equipped with 40J, 15 HP Motors.

CUTTING MACHINES FOR SALE

- 2—512 E3H Goodman Cutting Machines, 250 Volt D.C.
- 2—29LC Jeffrey Cutting Machines, 250 Volts D.C.
- 1—10RU Joy Cutting Machines, 250 Volt D.C. with budguster.
- 2—29UC Jeffrey Universal Cutters, Permissible, 250 Volts D.C.
- 1—512 CCH Goodman Cutting Machine, 250 Volts D.C.
- 4—35B Jeffrey Cutting Machines, 250 Volts D.C.
- 6—35BB Jeffrey Cutting Machines, 250 Volts D.C.
- 2—7AU Sullivan Cutting Machines, 250 Volts D.C.
- 3—35L Jeffrey Machine.
- 1—11RU Joy Cutting Machine, 250 Volt D.C.

CONTINUOUS MINERS FOR SALE

- 2—1CM Joy Continuous Miners, 250 Volts D.C.
- 3—4JCM Continuous Miners, 440 Volts A.C.
- 1—5 JCM Joy Continuous Miner with self-tramming and extensive belt, 440 Volt AC, complete with 1000 feet of structure and belting with bridge conveyor between miner and belt.

RECTIFIERS FOR SALE

- 1—400 KW American Selenium Rectifier, 4160 Volts Primary, 275 Volts D.C.

ROTARY CONVERTERS FOR SALE

- 1—300 KW Westinghouse, Pedestal Type Converter, 275 Volts D.C., Primary 2300/4000.
- 1—150 KW Rotary Converter, Serial No. 1054562, with 150 KVA transformer and panel boards.
- 1—100 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.

- 1—150 KW Westinghouse Rotary Converter, Pedestal Type, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C.
- 1—200 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.

COAL DRILLS FOR SALE

- 1—Chicago Pneumatic RBD-30 Roof Drill.
- 25—CP-472 Electric Coal Drills, 250 Volts D.C.
- 5—CP-572 Coal Drills.
- 10—Chicago Pneumatic Little Giant 572 Coal Drills, 3 phase, 220 Volt A.C., permissible, New.
- 1—CD-25 Coal Drill, 250 Volts D.C.

CRUSHERS FOR SALE

- 1—Gruendler Ring Hammer 24" x 30" Crusher, Serial No. 17477.
- 1—36" x 36" Double Roll Crusher, complete with 100 H.P. Motor.
- 1—Robins 36" x 36" Double Roll Stoker Crusher, specially built with spike teeth equipped with extra set of new segments.
- 1—Pennsylvania Single Roll Crusher, 24 x 40.

COMPRESSORS FOR SALE

- 2—Acme Self-propelled Air Compressors, 83R, Model 168, Capacity 176CFM, with 40 H.P. Reliance Compound Motor. Excellent Condition.

LOCOMOTIVES FOR SALE

- 1—MH-150 Jeffrey Locomotive, 42" track gauge, 250 Volts D.C., 26 1/2" high, rebuilt.
- 1—General Electric 6 Ton Locomotive with Reel, 36" gauge.
- 1—1030 Goodman Locomotive, 24" high, 44" track gauge.

ROCK DUSTERS FOR SALE

- 1—MSA Track Mounted Rock Duster, 10 H.P., A.C., or D.C., high pressure, 30" high, any gauge.
- 2—MSA Bantam Rock Dusters, Rubber Tired, Portable.
- 2—MSA Bantam Rock Dusters, Skid Mounted.
- 1—American Mine Door, Wheel mounted bantam type rock duster, 250 Volts D.C., 22" high.

HOISTS FOR SALE

- 2—Brownie Hoists, 5 H.P., A.C.
- 6—#11 1/2 Vulcan-Denver Material Hoists, Complete with 3 H.P. D.C. Compound Wound 1750 RPM General Electric Motor.
- 1—Brownie Hoist, Model HKM—Good condition.
- 1—Sullivan Type CHL, 5 H.P., Car Spotting Hoist.
- 2—Joy CHD Hoists, 10 H.P.

ELEVATORS FOR SALE

- 2—Joy PL11-16 Elevating Conveyors.

MACHINE TRUCKS FOR SALE

- 1—T2-SAPE Joy Machine Truck, 250 Volts, D.C., equipped with hydraulic system for drill.
- 4—T2-SAPE Joy Trucks, 250 Volts D.C. Permissible.

CHAIN CONVEYORS FOR SALE

- 5—61AM Jeffrey Chain Conveyors, 10 H.P. 300' long.
- 3—61HG Jeffrey Chain Conveyors, 5 H.P. 40' long.
- 1—Jeffrey 300 ft. 15" Chain Conveyor.

DIESEL PLANTS FOR SALE

- 1—100 KW Waukesha Diesel Generator with 220/440 Volts D.C.
- 1—100 KW Diesel Generator Unit, with G.M. Diesel Engine and 100 KW Generator.
- 1—D13000 Caterpillar Diesel Generator Unit—with Caterpillar engine and 75 KVA G.E. generator self-regulating, 220 Volt A.C.

MOTOR GENERATORS FOR SALE

- 1—150 KW General Electric Motor Generator Set, 2300 Primary, 275 Volts D.C.
- 1—150 KW General Electric Motor Generator Set, 440 Volts A.C. Primary, 275 Volts D.C.
- 1—50 KW Westinghouse MG Set, 440 Volt A.C., 250 Volt D.C.
- 1—300 KW Westinghouse Motor Generator Set, synchronous motor, 433 KW Output, 435 KVA, 2200 Volts, 1200 RPM, D.C. generator 300 KW, 275 Volts, 1200 RPM. Compound Wound. Complete with D.C. panel and switch gear.
- 3—50 KW G.E. and Westinghouse Motor Generator Sets, 2300 Volts A.C., 275 Volts D.C. Complete with switching gear.
- 1—200 KW Ridgeway Motor Generator Set, Complete with switchgear and 1600 amp. 1-T-E automatic circuit breaker, 2300 A.C., 275 Volts D.C.

BELT CONVEYORS FOR SALE

- 1—36" Joy Self-Tramming Extensible Belt, 1200 ft. long with belt and drive.
- 1—30" Joy Self-Tramming Extensible Belt, 1000 ft. long with belt and drive.
- 1—300 ft. Jeffrey Conveyor Line, complete
- 1—350 ft. LaDel Conveyor Line, complete.
- 300 ft. Joy 15" Pans and Chains.

ROOF BOLTING MACHINES FOR SALE

- 5—Fletcher Roof Bolting Machines; with permissible dust collectors.

THE FOLLOWING OFFERED AS A PACKAGE UNIT ONLY

- 1—5CM Joy Continuous Miner, 440 Volts A.C.
- 2—16SC Joy Shuttle Cars, matched pair, 440 Volts A.C.

MISCELLANEOUS FOR SALE

- 1—Compton Model 56 Auger with 300 H.P. Cummins Diesel Engine Drive, 210 feet 38" diameter auger (6 sections—35 feet each); 1—42" cutter head, 70 feet, 48" diameter auger (2 sections—35 feet each); 1—52" cutter head.
- 2—75 KVA Underground Transformers, Skid mounted 40" high.
- 3—30 KVA Underground Transformers, skid mounted, 40" high.
- 2—3 H.P. Gear Motors with 15" head and tail assemblies.
- 2—5 H.P. Gear Motors with 15" head and tail assemblies.
- 3—75 KVA Transformers, 2300/4000 Wye to 220 Volts.
- 3—35B Jeffrey Armatures, 250 Volts D.C.
- 4—902, 250 Volts D.C. Westinghouse Motor Units, only.
- 1—PL 11-14 Joy Elevator.
- 10—Goodman 512 Cutter Bars and Chains.
- 173—AC&F 42" Gauge, 48" high Drop Bottom Mine Cars. Condition like new.
- 1—24" Fan with drive.
- 2—7 1/2 H.P. Tricycla Type Rubber Tired Mine Tractors, 7 1/2 H.P. 220 Volt Single Phase Motors or 250 Volt D.C. Motors.
- 3—24 J Motors, 7 1/2 H.P. 250 Volt D.C.
- 2—42" Track Gauge Phillips Carriers.
- 1—Manson Mine Jeep 40" Track Gauge equipped with 9J Motor.

Large quantities of 40# and 60# ASCE Steel.

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JOY EQUIPMENT—REBUILT

- 3-Joy 14BU 9AE Super Loader—26" HI—New 1958.
 - 3-Joy 14BU Loaders, low pedestal, 7AE, 1956 & 57.
 - 6-Joy 14BU Loaders, medium pedestal, 7RBE.
 - 4-Joy 14BU 3PE Loaders.
 - 1-Joy 14BU 3PE Loaders.
 - 2-Joy 12BU Loaders complete with Piggybacks.
 - 2-Joy 12BU Loaders, 9E, latest type, 250 V. D.C.
 - 3-Joy 12BU Loaders, 220/440 Volt AC.
 - 1-Joy 20BU Loader, latest type.
 - 4-Joy 11BU Loaders, latest type.
 - 1-Joy 8BU Loader, 34" overall height.
 - 2-Joy 8BU Loaders, 220 V. AC.
 - 1-Joy curved Bar Head for 14BU, complete.
 - 6-Reliance 24-J Motors, 7½ H.P.
 - 4-Reliance 38-J Motors, 10 H.P.
 - 4-Reliance 40-J 15 H.P. Motor.
 - 20-S-J Motors, 4 H.P.
 - 2-Goodman 660 Loaders on Crawlers 440 V. AC, like new.
 - 1-Goodman 660 Loader on Crawlers, excellent 250 V. D.C.
 - 1-Goodman 665 Loader on Crawlers, latest type 250 V. D.C.
 - 1-Goodman 865 Loader, 26" hi. Rebuilt. 250 V. D.C.
 - 4-Joy 8SC Shuttle Cars, rebuilt.
 - 4-Joy 6SC Shuttle Cars, rebuilt, latest type.
 - 1-Joy 5SC Shuttle Cars. Excellent.
 - 2-Joy 32E9 Shuttle Cars.
 - 2-Joy 32E10 Shuttle Cars, rebuilt.
 - 6-Joy 32E15 Shuttle Cars, rebuilt.
 - 4-Joy 32E16 Shuttle Cars, rebuilt.
 - 10-Joy 42E16 Shuttle Cars, rebuilt.
 - 1-Joy CO-22 Drill, on rubber, like new.
 - 6-Joy T-2-5 low pan Crawler Trucks, rebuilt.
 - 1-Joy T-2-6 low pan Crawler Truck with reel.
 - 2-Joy T-1 Standard Crawler Trucks, 220 AC.
 - 1-Joy T-1 Standard Crawler Trucks, 220 DC.
 - 1-Joy T-1 Cutting Mach., like new, 35 & 50 H.P.
 - 1-Joy T-1 Cutting Machine, like new, 250 V. D.C.
 - 2-Goodman 212 Cutting Machines, 19" high.
 - 1-Goodman 312 Cutting Machine, 17" high.
 - 3-Goodman 412 Cutting Machines, 19" high.
 - 1-Goodman Machine on Crawler, 31" high. All hydraulic.
 - 6-Goodman 512 Machines with Bugdusters.
 - 6-Goodman 612 Cutting Machines, 250 and 500 volt.
 - 1-Jeffrey 70 URB rubber tired Cutter, Universal head, perfect condition.
 - 1-Goodman 2410 Rubber Tired Cutter, Universal head, like new.
 - 3-Joy 11RU Rubber Tired Cutters with bugdusters, Universal heads, dual tires, like new. 250 V. D.C.
 - 1-Joy 10RU Rubber Tired Cutter, Universal head, 220/440 V. A.C. Perfect.
 - 4-Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C. Rebuilt or as is.
 - 6-7AU's on track. Universal head.
 - 2-Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on Crawlers, 250 volt D.C.
 - 1-Jeffrey 29LC on Crawlers, rebuilt.
- ### LOCOMOTIVES
- 1-Goodman 8 ton, 93-A, 27" high, armor plate frame.
 - 1-Jeffrey 15 ton MH-77 Locomotive, armor plate frame.
 - 3-Jeffrey, 13 ton, type MH-110, 36", 42", 44" ga.
 - 2-Jeffrey, 10 ton, type MH-110, 42" and 44" ga.
 - 2-Jeffrey, 10 ton, type MH-78, 42" and 44" ga.
 - 2-Goodman 8-30 and 10-30 Locos., 26" above rail.
 - 1-Jeffrey MH-150, 8 ton, 26" overall height, rebuilt, with reel.
 - 12-Jeffrey, 6 ton, type MH-88, 42", 44" and 48" ga.
 - 4-Jeffrey, 8 ton, type MH-100 2½" armor plate frames.
 - 3-Jeffrey, 4 ton, type MH-96, 42", 44", 48" ga.
 - 1-G.E., 4 ton, type 825 Locomotive, 22" high.
 - 10-G.E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" ga.
 - 1-G.E., 8 ton, type 822 Locomotive, 44" ga.
 - 3-G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" ga.
 - 2-G.E. 13 ton, type 829 Locomotives, armor plate frames.
 - 1-Goodman 91A Locomotive, 8 ton, 26" overall height.
 - 2-Goodman, type 33, 8 ton, 44" and 48" ga.
 - 3-Westinghouse, type 902, 4 ton, 42" and 48" ga.
 - 2-Atlas Battery Locomotives, 36" ga.
 - 1-Atlas Trolley Locomotive, 4 ton, 24" high.
 - 2-Westinghouse, type 904, 6 ton, 44" and 48" ga.
 - 2-Westinghouse, type 906, 44" and 48" ga.
 - 2-Westinghouse, type 907, 10 ton, 44" and 48" ga.
- 3-Westinghouse 908, 13 ton, Locomotive, 42"-48" ga.
 - 8-Jeffrey MH-78 Locomotive Units, cheap.
 - 6-Jeffrey MH-100 Locomotive Units, reasonable.
 - 3-Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" ga.
- Locomotive Trucks & Spare Armatures for the above.
- ### TIPPLE EQUIPMENT
- 1-All Steel 5 Track Tipple, new 1957, complete with washer, silo, oil treating system, all bolted construction.
 - 1-Complete Five Track Tipple with Washers and Air Tables.
 - 1-Complete stoker plant, all steel.
 - 2-Complete Tipples, 3 & 5 track, steel and wood.
 - 3-Cleaning Plants, 1 Ea. McNally, Roberts and Schaefer, Jeffrey, Washers and Air-Flo Tables.
 - 4-Complete Aerial Trams for coal or refuse.
 - 3-Complete Rope and Button Lines.
 - 2-Monitor Lines complete with Drums, excellent.
 - 1-Allis-Chalmers 5' x 12' Rippflo Vibrator.
 - 1-Allis-Chalmers 4' x 12' Low-Head Vibrator.
 - 1-Robins Gyrex Vibrator, 4 x 10.
 - 10-Belt and Apron type Loading Booms.
 - 6-Shaker Screens.
 - 1-Robins Car Shakeout.
 - 1-Lundlach Crusher, like new.
 - 20-Crushers, various sizes—Jeffrey, McLanahan & McNally.
 - 4-Mine Scales, 10 & 20 ton.
 - 3-Truck Scales, 25 to 40 ton, late type.
- Feeders, Belt and Drag Conveyors, Car Retarders.
- ### CUTTING MACHINES
- 1-Joy 10RU Rubber Tired Cutter, Universal head, 220/440 volt A.C. Perfect.
 - 3-Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C. as is or rebuilt.
 - 2-Joy 11RU Rubber Tired Cutters, 250 V. D.C. rebuilt.
 - 1-Goodman 2410 Rubber Tired Cutter, Universal head, new 1956. Excellent.
 - 2-Jeffrey 29UC Universal Machines on Crawlers.
 - 1-Goodman on Crawlers, 31" overall height.
 - 3-Baby Goodman 212's, rebuilt, 250 V. D.C.
 - 4-Goodman 312 Cutting Machines, 17" high.
 - 3-Goodman 412 Cutting Machines, 19" high.
 - 3-Goodman 512's, with Bugdusters, like new.
 - 4-Goodman 512's, rebuilt, or as removed from service.
 - 6-Goodman 612's—250 & 500 Volt.
 - 3-Goodman 112's, 220/440 V. A.C.
 - 1-Joy 7-B Cutting Machine, 250 V. D.C.
 - 4-Joy 11B Cutting Machines, rebuilt, 35 & 50 H.P.
 - 6-7AU's, on track, Universal Head.
 - 10-Goodman 12AA's and 11AA's, 250 V. D.C.
 - 2-Goodman 324 Slabbers.
 - 2-Goodman 724 Slabbers.
 - 2-Goodman 824 Slabbers.
 - 6-Jeffrey 35L's, like new, 250 V. D.C., 17" high.
 - 2-Jeffrey 35L's, on low vein trucks.
 - 2-Jeffrey 35L's 220/440 A.C.
 - 3-Jeffrey 35BB's, 220/440 A.C.
 - 15-Jeffrey 35B's and 35BB's 250 V. D.C.
 - 2-Jeffrey 29B's on track.
 - 10-Jeffrey 29C's, track mounted.
 - 2-Jeffrey 29L's, on Crawlers. Excellent.
 - 4-Sullivan CE7, 220/440 V. A.C.
- ### CONVEYORS
- 2-Goodman 97HC 30" & 36" Rope Belts, 1600' perfect. With or without rubber.
 - 2-Jeffrey 52-B tandem drive 30" Belt Conveyors, 1,500'.
 - 1-Jeffrey 52-B tandem drive 26" Belt Conveyor.
 - 1-Joy 30" Underground Belt Conveyor. Excellent.
 - 1-Goodman 97-C, 30" tandem drive.
 - 1-Goodman 97-C, 26" Conveyor, 1,000' long.
 - 1-Robins 36" tandem drive, with or without structure.
 - 1,200' Robins 36" Underground Structure, like new.
 - 1,000' Conveyor Belt, 42".
 - 4,000' Conveyor Belt, 36".
 - 3,000' Conveyor Belt, 30".
 - 4,000' Conveyor Belt, 26".
 - 8-Jeffrey 61AM 12" Chain Conveyors, 300'.
 - 2-61W Elevator Conveyors.
 - 2-61WH 15" Room Conveyors, 300'.
 - 2-Joy 15" Room Conveyors, 300'.
 - 2-Joy 20" Conveyors, 300'.
 - 4-Joy Ladel UN-17 Shakers.
 - 10-Goodman G-12½ and G-15 Shakers.
 - 1,000' Goodman 18" Flat Belt Conveyors, tandem drive any length. Perfect.
- ### CONVERTERS AND DIESEL PLANTS
- 2-500KW G.E. Stationary Rectifiers.
 - 4-1,000KW Stationary Rectifiers.
 - 2-100KW, G.E. TCC-6's, 275 V., Rotary Converters.
 - 1-150KW, G.E. HCC-6, 275 V., Rotary Converter.
 - 1-150KW, 6 phase, Allis-Chalmers Rotary Converter, 275 V. D.C.
 - 2-200KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Steel frames. Newly rewound.
 - 3-300KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Like New.
 - 2-300KW Westinghouse, 6 phase, Rotary Converters, 275 V. D.C.
 - 2-500KW West. Rotary Converters, 275 V. D.C.
 - 2-200KW Westinghouse Rotary Converters, 275 V. D.C. Newly rewound.
 - (All the above with 6900/13000 and/or 2300/4000 primary transformers)
 - 2-100 KW MG Sets, 275 V. D.C.
 - 2-150KW MG Sets, G.E. and West., 275 V. D.C.
 - 1-200KW MG Set, West., rebuilt, 275 V. D.C.
 - 1-200KW MG Set, G.E., perfect, 275 V. D.C.
 - 2-300 KW G.E. MG Sets, like new.
 - 1-300KW Westinghouse, 600 volt MG Set, rebuilt.
 - 2-300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
 - 2-500KW Westinghouse, 600 volt, D.C., 6 phase, Rotary Converters.
 - 2-500KW HCC-6's, Rotary Converters, 6 phase, 600 V. D.C.
 - 3-GMC-671 Diesels with 75 & 110KW, 250 V. D.C. Gen.
 - 1-GMC-471 Diesel with 60KW, 250 V. D.C. Gen.

LOADING MACHINES

- 16-Joy Loaders, 14BU, 12BU, 8BU, 11BU, 20BU.
- 5-Joy 12BU9E Loaders, 220/440 V. A.C. Excellent.
- 1-Joy 12BU9E Loaders, latest type.
- 2-Joy 12BU with Piggyback Conveyors.
- 2-Goodman 865 Loaders, 26", on Crawlers.
- 1-Goodman 665 Loader on Crawlers, rebuilt.
- 2-Goodman 660 Loaders, 440 V. A.C., perfect.
- 1-Goodman 660 Loader, on Crawlers, 250 V. D.C.
- 1-Goodman 460, on track, rebuilt, all hydraulic.
- 2-Jeffrey 61 CLK's on rubber, 26".
- 2-Jeffrey L-500 Loaders.
- 2-Myers Whaley, No. 3 Automatic Loaders.
- 2-Clarkson Loaders, 28" above rail.

MISCELLANEOUS

- 150 Tons Copper—4/0 and 9 Section Trolley 1/0, 2/0, 4/0 Stranded. 500 MCM, 750 MCM—1,000,000 MCM insulated.
- 1 Each 4'-5', 6' & 8' HI Pressure Joy & Jeffrey latest type fans.
- 1-Complete Five Track Tipple with Washers and Air Tables.
- 5-Complete Tipples, 3 to 5 Track. Wood and Steel. Steel Trestles for drop bottom cars.
- All Steel Armco Buildings.
- 20-Jeffrey Molveyours on rubber tires.
- 1-¾ Yard Shovel and Back-Hoe.
- 1-¾ Yard Crawler Crane.
- Battery Supply Tractors, Rubber Tired.
- 1-Cantrell Air Compressor on rubber tires.
- 10-Air Compressors, 1 H.P. to 40 H.P.
- 2-Joy self-propelled rubber tired comp., 240 cu. ft.
- 2-Acme self-propelled rubber tired compressors, 130 cu. ft.
- 40-Mine Pumps, all types.
- 1-Differential 40 Passenger Man-Trip Car.
- 6-MSA Rock Dusters.
- 2-Phillips Carriers, 44" and 48" ga.
- 1-Barber-Greene self-propelled Bucket Elevator.
- Pipe, Plastic, Steel, Transit, all sizes 1" to 6".
- 25,000 Roof Bolts, all types.
- 300-Mine Cars, drop bottom, 42" ga.
- 90-Mine Cars, drop bottom, 44" ga.
- 30-Mine Cars, drop bottom, 48" ga.
- 100-Mine Cars, 18" high, end dump, 44" ga.
- 300-Mine Cars, end dump and drop bottom, 20" high, 48" ga.
- 1-10 ton Mine Car Scale with Recorder.
- 4-Brown Fayro 15 HP latest type Hoists.
- 15-Brown Fayro HXL and HG Car Spotters.
- 1-Brown Fayro Hydraulic Car Spotter.
- 1-12 ton Differential Slate Larry.
- Incline Hoists, 25 to 50 H.P.
- 1-Jeffrey 5', 6' & 8' Aerodyne Fans, Like New.
- 2-Storage Tanks, 4,000 Gallons.
- 2-Storage Tanks, 10,000 Gallons.
- 10,000 Five Gallon G.I. Cans, screw lids.
- 2,500 tons Relaying Rail, 25lb., 30lb., 40lb., 50lb., 60lb., 70lb.
- 500 MCM, 750 MCM, 1000 MCM, Bare & Insulated. Thousands of feet of rubber covered three conductor cable. All sizes.
- 300-Transformers from 1 to 300 KVA, 110 to 13,000 primary volts.
- 400-Electric Motors, 3 to 250 H.P.
- Huge Stock of Mine Supplies.
- 600-MSA Mine Lamps, Chargers, etc.
- 4-Mine Scales, 10 & 20 ton.
- 5-Truck Scales, 25 to 40 ton, late type.
- Track & International tandem dump trucks.

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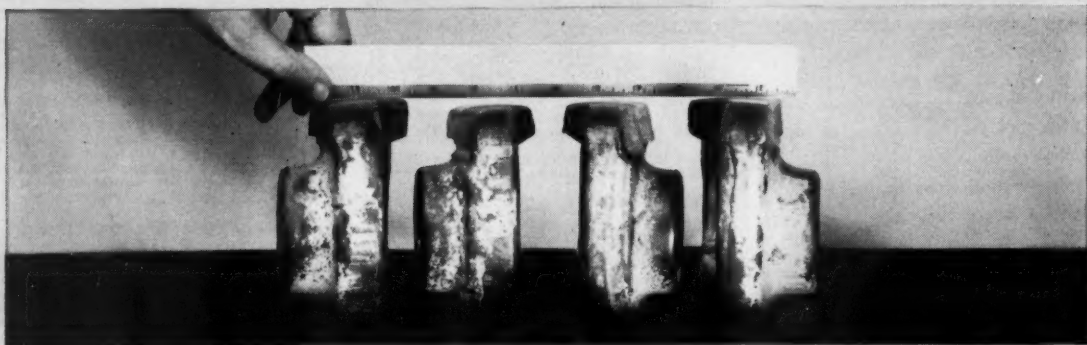
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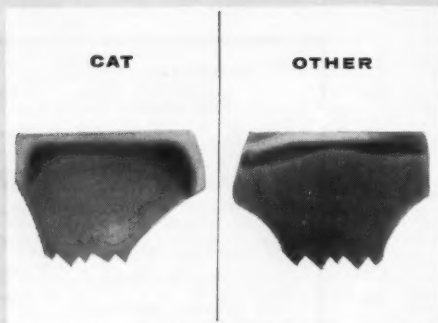


WHAT YOU DON'T SEE CAN HURT YOU

You can buy a lot of parts that *look* like genuine Caterpillar parts. Some may be cheaper initially. But they are as different as night and day when you get them in service.



Take these links, for example. They all *looked* identical when new. But see what has happened after 2000 hours on the same D8 Tractor! The two links in the center, a popular brand with induction-hardened rails, cost about 9% less than Caterpillar links originally, but showed about 50% more wear.



The extra service you can expect from the Cat links can be seen and compared with other brands. Here are actual photos of etched cross sections of *production* links made by Caterpillar and the other manufacturer. The light areas at top show case depth and pattern of wear-resistant rail material resulting from heat treatment. See the deep, uniform wear case on top *and* sides of the Cat part? It's as hard as a good ball-peen hammer head. But in the other brand, the wear case varies both in depth and hardness . . . that's the reason why after 2000 hours on a D8 the Cat-made links had worn 50% less.

Investigate and you will find superiorities for every undercarriage component built by Caterpillar. This extra quality—though it sometimes costs a little more initially—pays off by delivering *extra* trouble-free working hours. That's why genuine Caterpillar parts cost you less per hour than other brands.

And when it's time to replace or rebuild your tractor undercarriage, see your Caterpillar Dealer. He is an undercarriage specialist with modern facilities to back him up. Get the full story on his many money-saving options and recommendations *tailored to your job conditions*. Truly CUSTOM TRACK SERVICE, designed to save you money . . . and offered only by your Caterpillar Dealer.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

CATERPILLAR

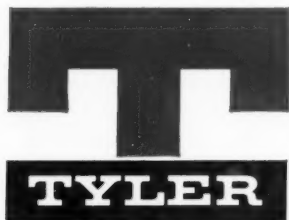
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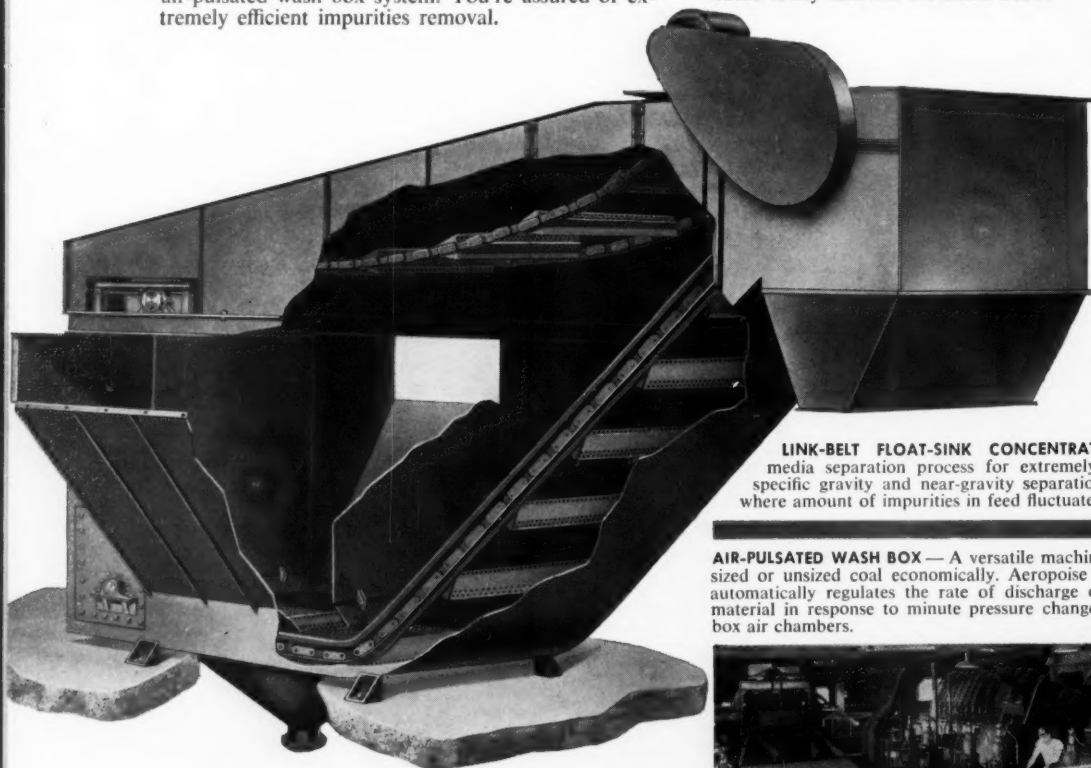
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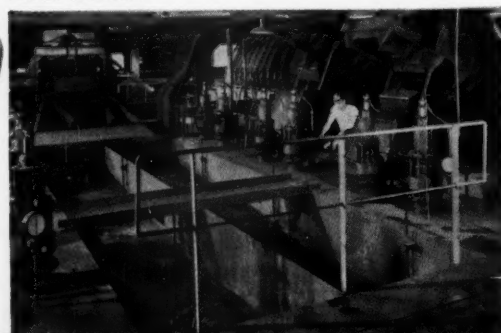
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